

Course Syllabus

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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-EHEP003510.html>) (<http://www.wiley.com/WileyCDA/WileyTitle/productCd-EHEP002022.html>) (**Required**). Reading will nominally be assigned from 8th 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: 12-2pm Wednesdays

Location: 5126 Etcheverry

GSI:

Marleigh Duncan:

Discussion: Thursday 3-4pm 103, 240 Mulford

Email: mkduncan5@berkeley.edu (<mailto:mkduncan5@berkeley.edu>) (please see email policy below)

Office hours: 4-6pm Thursdays

Location: Hesse 136

Benjamin Keyser

Discussion: Wednesday 5-6pm, Etcheverry 3109

Email: keyser@berkeley.edu (<mailto:keyser@berkeley.edu>) (please see email policy below)

Office hours: 2-4pm Wednesdays

Location: Hesse 136

Andrew Sanville

Discussion: Tuesday 2-3pm, 240 Mulford

Email: amsanville@berkeley.edu (<mailto:amsanville@berkeley.edu>) (<mailto:spencerfrank@berkeley.edu>) (please see email policy below)

Office hours: 2:30-4:30pm Fridays

Location: Hesse 136

Email Policy: For email to instructor or GSI: 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, 25% Projects (3), 35% ODKs (2), 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** questions on Piazza. I encourage transfer of knowledge (not solutions per se) among peers (use common sense and Honor Code).

Turning in homework: Submit to Gradescope

Grading notes:

- While homework serves educational and evaluational roles, 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.
- Grade-focused conversations should be 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
9. Computational Fluid Dynamics




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>
[\(http://asuc.org/honorcode/resources/HC%20Guide%20for%20Syllabi.pdf\)](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 at during the first week of the semester. Further information can be found at: <http://dsp.berkeley.edu/facresponsibilities.html>
[\(http://dsp.berkeley.edu/facresponsibilities.html\)](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:

Course Summary:

Date	Details
Wed Jan 18, 2017	 Munson Ch 1 (https://bcourses.berkeley.edu/courses/1457951/assignments/7767301) due by 11:59pm
Fri Jan 20, 2017	 Background Survey (https://bcourses.berkeley.edu/courses/1457951/assignments/7772304) due by 11pm
Mon Jan 23, 2017	 Munson 2.1-2.6 (https://bcourses.berkeley.edu/courses/1457951/assignments/7767302) due by 11:59pm

Date	Details	
Fri Jan 27, 2017	 Assignment 1 (https://bcourses.berkeley.edu/courses/1457951/assignments/7767005)	due by 11:59pm
	 Munson 2.8-2.12 (https://bcourses.berkeley.edu/courses/1457951/assignments/7767742)	due by 11:59pm
Fri Feb 3, 2017	 Assignment 2 (https://bcourses.berkeley.edu/courses/1457951/assignments/7767006)	due by 11:59pm
	 Munson 3.1-3.5 (https://bcourses.berkeley.edu/courses/1457951/assignments/7767304)	due by 11:59pm
Mon Feb 6, 2017	 Munson 3.6-3.8 (https://bcourses.berkeley.edu/courses/1457951/assignments/7767305)	due by 11:59pm
Mon Feb 13, 2017	 Assignment 3 (https://bcourses.berkeley.edu/courses/1457951/assignments/7767007)	due by 11:59pm
	 Munson 4.1-4.2 (https://bcourses.berkeley.edu/courses/1457951/assignments/7767306)	due by 11:59pm
Wed Feb 15, 2017	 Project 1 (https://bcourses.berkeley.edu/courses/1457951/assignments/7766995)	due by 11:59pm
Fri Feb 17, 2017	 Munson 4.3-4.4 (https://bcourses.berkeley.edu/courses/1457951/assignments/7767788)	due by 11:59pm
Fri Feb 24, 2017	 Assignment 4 (https://bcourses.berkeley.edu/courses/1457951/assignments/7767009)	due by 11:59pm
Mon Feb 27, 2017	 ODK 1 (https://bcourses.berkeley.edu/courses/1457951/assignments/7766999)	due by 6pm
Wed Mar 1, 2017	 Munson 5.1-5.2 (https://bcourses.berkeley.edu/courses/1457951/assignments/7767307)	due by 11:59pm
Wed Mar 8, 2017	 Munson 6.1-6.4 (https://bcourses.berkeley.edu/courses/1457951/assignments/7767309)	due by 11:59pm
Fri Mar 10, 2017	 Assignment 5 (https://bcourses.berkeley.edu/courses/1457951/assignments/7767011)	due by 11:59pm
Mon Mar 13, 2017	 Munson 6.5-6.7 (https://bcourses.berkeley.edu/courses/1457951/assignments/7767310)	due by 11:59pm
Fri Mar 17, 2017	 Assignment 6 (https://bcourses.berkeley.edu/courses/1457951/assignments/7767012)	due by 11:59pm
Mon Mar 20, 2017	 Munson 6.8-6.10 (https://bcourses.berkeley.edu/courses/1457951/assignments/7767311)	due by 11:59pm
Wed Mar 22, 2017	 Project 2 (https://bcourses.berkeley.edu/courses/1457951/assignments/7766996)	due by 11:59pm
Fri Mar 24, 2017	 Assignment 7 (https://bcourses.berkeley.edu/courses/1457951/assignments/7767013)	due by 11:59pm
Mon Apr 3, 2017	 Munson Ch 7 (https://bcourses.berkeley.edu/courses/1457951/assignments/7767312)	due by 11:59pm

Date	Details
Mon Apr 10, 2017	📅 Assignment 8 (https://bcourses.berkeley.edu/courses/1457951/assignments/7767019) due by 11:59pm
Mon Apr 17, 2017	📅 ODK 2 (https://bcourses.berkeley.edu/courses/1457951/assignments/7767020) due by 6pm
Fri Apr 21, 2017	📅 Assignment 9 (https://bcourses.berkeley.edu/courses/1457951/assignments/7767021) due by 11:59pm
Tue May 2, 2017	📅 Project 3 (https://bcourses.berkeley.edu/courses/1457951/assignments/7766998) due by 11:59pm
Tue May 9, 2017	📅 Final Exam (https://bcourses.berkeley.edu/courses/1457951/assignments/7767022) due by 11:59pm