

# USC Viterbi School of Engineering

## AME 309 Dynamics of Fluids

**Units** 4  
**Term** Fall 2016 **M Aug 22<sup>nd</sup> – F Dec 2<sup>nd</sup>**  
**Section** 28736

**Location** Lecture T/Th 10 – 11:50 am SOS B2  
 See course Blackboard page for updates

**Instructor** Charles Radovich  
**Office** RRB 202  
**Office Hours** T/Th 2 – 4p and by appt.  
**Contact Info** radovich@usc.edu (213) 740.5359

**Teaching Assistant** Jonas Buchmeier  
**Office** RRB 208 (Laufer Library)  
**Office Hours** M/W 8:30 – 11am  
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### Course Description

An introduction to concepts and analysis methods of fluid mechanics. Topics covered include: hydrostatics; buoyancy; conservation of mass, momentum, and energy in integral and differential form; dimensional analysis; control volume analysis; open channel flows; boundary layers; lift and drag on objects; laminar and turbulent pipe flow; compressible flow; potential flow over bodies.

**Co-Requisite (s):** MATH 245  
**Recommended Preparation:** AME 201, AME 310

**Textbook** Frank White, Fluid Mechanics, 7th Ed, McGraw-Hill, Inc. **(required)**

**Grading** 15% Homework | 15% Project | 2 x 20% Midterm Exams | 30% Final Exam

### Discussion Board

This course will use Piazza for all class discussions. Refrain from emailing questions related to assignments, midterms, etc., and instead use Piazza. TA's, myself and even you can answer questions as they arise, thus providing an efficient means for communication. If you have issues accessing the Piazza, contact [team@piazza.com](mailto:team@piazza.com) directly. Before the semester begins, verify that you have access to these websites; Piazza is accessed from within the Blackboard page. **Recommended download:** Piazza App for phones. It works!

**Exams** There are two Midterms and one cumulative Final Exam. See the course schedule.

**Project** AME 309 includes a design project where theory is put into practice. Previous semesters have designed, constructed and launched a soda bottle water rocket; here's a video from a previous launch: <http://vimeo.com/81151514>. A project of similar theme will be completed this semester as well.

**Software** **Matlab:** student license available at <http://software.usc.edu/>  
**MS-Excel:** student license available at <https://itservices.usc.edu/officestudents/>  
 These programs are also available in all USC computer labs.

**Schedule** See next page.

Week	Topics	Reading
1	Characterizing a fluid and the state-of-stress in a fluid	Ch.1
2-3	Fluid statics: manometry, forces on submerged surfaces	Ch.2
4	Conservation of mass	Ch.3
5	Conservation of momentum	Ch.3
6-7	Conservation of energy	Ch.3
	Bernoulli's equation along a stream tube with and without losses	Ch.3
8	Concepts from dimensional analysis	Ch.5
<b>Midterm 1 (Thursday, October 6<sup>th</sup>)</b>		
9	Flow in pipes and ducts with losses	Ch.6
10	Boundary layer flows	Ch.7
11-12	Flow past bluff bodies	Ch.7
<b>Midterm 2 (Tuesday, November 8<sup>th</sup>)</b>		
<b>Rocket Day (Friday, November 11<sup>th</sup>)</b>		
13	Flow in open channels (friction, channel transitions, hydraulic jumps)	Ch.10
13-14	Compressible flow (subsonic & supersonic flow, shock waves)	Ch.9
<b>Rocket Data Report (Tuesday, November 29<sup>th</sup>)</b>		
15	Equations of motion in differential form	Ch.4
<b>Final Exam (Tuesday, December 13<sup>th</sup> 8-10am)</b>		

### Description and Assessment of Assignments

There will be two Midterm Exams held during the regular lecture time, and one Final Exam. All written exams will be closed book and closed notes unless noted otherwise. Homework sets will be assigned weekly. It is your responsibility to complete the problem set and to submit the assignment by hand before the due date.

Each assignment is due **before** class begins, or as specified in class announcements. Physical documents must be handed in; electronic submissions will not be accepted. **All assignments are due before the start of lecture. Late assignments will not be accepted. One microsecond (1  $\mu$ s) late is considered late and there are no exceptions.**

In order to receive credit for your work, all homework and exam problems must be presented in a clear, organized manner. Solutions must show evidence of work; "magic" answers will not be accepted. Partial credit may be given if the solution is presented in a logical fashion. There are office hours throughout the week to help you with the course material; this time is best utilized when students come prepared with an attempt at a solution, thus allowing us to help you through your thought process.

There are no make-up assignments or exams. The lowest homework grade will be dropped from your total score; use this to your advantage if you have an upcoming schedule conflict. Everything else will count towards the final grade. Absences for medical reasons must be justified with some verifiable evidence; first obtain doctor's note, then see me.

All homework and exams are to be completed as an individual. Failure to comply with this requirement will result in a failing grade for the course. All students should read the Academic Conduct section below.

## Academic Conduct

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Familiarize yourself with the discussion of plagiarism in *SCampus* in Section 11, *Behavior Violating University Standards* <https://scampus.usc.edu/b/11-00-behavior-violating-university-standards-and-appropriate-sanctions/>, and **view the guidelines presented in Appendix A at the end of this document**. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct>.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the *Office of Equity and Diversity* <http://equity.usc.edu> or to the *Department of Public Safety* <http://capsnet.usc.edu/department/department-public-safety/online-forms/contact-us>. This is important for the safety of the whole USC community. Another member of the university community – such as a friend, classmate, advisor, or faculty member – can help initiate the report, or can initiate the report on behalf of another person. *The Center for Women and Men* <http://www.usc.edu/student-affairs/cwm/> provides 24/7 confidential support, and the sexual assault resource center webpage <http://sarc.usc.edu> describes reporting options and other resources.

## Support Systems

A number of USC’s schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the *American Language Institute* <http://dornsife.usc.edu/ali>, which sponsors courses and workshops specifically for international graduate students. *The Office of Disability Services and Programs* <http://dsp.usc.edu/> provides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, *USC Emergency Information* <http://emergency.usc.edu> will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.

## Appendix A: Academic Dishonesty Sanction Guidelines

<b>Violation</b>	<b>USC - Recommended Sanction for Undergraduates*</b>	<b>AME - Recommended Sanction for Undergraduates and Graduates</b>
<b>Copying answers from other students on any course work.**</b>	F for course.	First offense: F on assignment. Second offense: F for course.
<b>One person allowing another to cheat from his/her exam or assignment.</b>	F for course for both persons.	If assignment: First offense: F on assignment. Second offense: F for course. If exam: F for course.
<b>Possessing or using material during exam (crib sheets, notes, books, etc.) which is not expressly permitted by the instructor.</b>	F for course.	First offense: F on exam. Second offense: F for course.
<b>Continuing to write after exam has ended.</b>	F for course.	F on exam
<b>Taking exam from room and later claiming that the instructor lost it.</b>	F for course and recommendation for further disciplinary action (possible suspension).	F for course
<b>Changing answers after exam has been returned.</b>	F for course and recommendation for further disciplinary action (possible suspension).	F for course
<b>Fraudulent possession of exam prior to administration.</b>	F for course and recommendation for suspension.	F for course
<b>Obtaining a copy of an exam or answer key prior to administration.</b>	Suspension or expulsion from the university; F for course.	F for course
<b>Having someone else complete course work for oneself.</b>	Suspension or expulsion from the university for both students; F for course.	F for course
<b>Plagiarism — Submitting other's work as one's own or giving an improper citation.</b>	F for course.	First offense: F on assignment. Second offense: F for course.
<b>Submission of purchased term papers or papers done by others.</b>	F for course and recommendation for further disciplinary action (possible suspension).	F for course
<b>Submission of the same assignment to more than one instructor, where no previous approval has been given.</b>	F for both courses.	F for both courses
<b>Unauthorized collaboration on an assignment.</b>	F for the course for both students.	First offense: F on assignment. Second offense: F for course.
<b>Falsification of information in admission applications (including supporting documentation).</b>	Revocation of university admission without opportunity to reapply.	Revocation of university admission without opportunity to reapply.
<b>Documentary falsification (e.g., petitions and supporting materials; medical documentation.)</b>	Suspension or expulsion from the university; F for course when related to a specific course.	Suspension or expulsion from the university; F for course when related to a specific course.
<b>Plagiarism in a graduate thesis or dissertation.</b>	Expulsion from the university when discovered prior to graduation; revocation of degree when discovered subsequent to graduation.***	Expulsion from the university when discovered prior to graduation; revocation of degree when discovered subsequent to graduation.***

\*Assuming first offense

\*\*Exam, quiz, tests, assignments or other course work.

\*\*\*Applies to graduate students