

AME 530a: Dynamics of Incompressible Fluids (3.0 Units)

Fall 2018

2:00-3.20pm Monday and Wednesday, OHE 100B

Instructor: Prof. Mitul Luhar (luhar@usc.edu)
Office Hours: Monday 3.30 – 4.30 pm, or by appointment (RRB 220)

TA: Christoph Efstathiou (efstathi@usc.edu)
TA Office Hours: Tuesday, 12.00 – 2.00pm (VHE 202)

Textbook and Other Resources:

There is no required text for this class, but *Fluid Mechanics* by Pijush Kundu, Ira Cohen, and David Dowling (6th Edition, Academic Press) is recommended. Readings will be suggested from this book to complement the material covered in class.

Other useful books:

- G.K. Batchelor, *An Introduction to Fluid Mechanics*, Cambridge University Press
- F.M. White, *Fluid Mechanics*, McGraw-Hill Education
- R. L. Panton, *Incompressible Flow*, Wiley
- M. Van Dyke, *An Album of Fluid Motion*, Parabolic Press*

*a beautiful book – check it out in the library!

Finally, there is a series of 39 videos developed by the National Committee for Fluid Mechanics Films (NCFMF) that I would highly recommend for anyone interested in the subject:

<http://web.mit.edu/hml/ncfmf.html>

Topics Covered:

1. Continuum viewpoint
2. Fluid statics
3. Conservation laws and control volume analyses
4. Navier-Stokes equations and viscous flow
5. Similarity, dimensional analyses, and Reynolds number
6. Laminar and viscous flows
7. Ideal flows
 - a. Potential flow theory, Kutta-Joukowski theorem
 - b. Surface waves
8. Vorticity and circulation
9. Boundary layers and separation
10. Instability
11. Introduction to turbulence

Assessment:

Homework:	30% (6 total)
Midterm Exam:	35% (take-home)
Final Exam:	35%

You can discuss homework problems with each other, but your solutions must be your own. Please indicate on your homework assignment if you have worked with another student. Assignments that are late will be penalized 25% for each day after the due date. All exams will open-notes.

Please notify the instructor at least 1 week ahead of time if you are unable to attend an examination or meet a homework deadline.

Desire2Learn (D2L):

D2L is the newest USC Viterbi course management platform, and we will be using it extensively. All lecture notes and videos will be made available online through this website. The system will also be used to manage the homework submission process. Each homework assignment will have its own Dropbox to which the students can upload solutions. The D2L system will also be set up with a discussion forum for the homework assignments (see Supplementary Materials). Students are encouraged to use this for peer-to-peer discussions instead of emailing the Instructor or TA. The instructor and TA will monitor these discussion forums periodically.

Please familiarize yourself with the D2L system as soon as possible.

<https://courses.uscden.net/d2l/home>

Gallery of Fluid Motion:

We will be running a *Gallery of Fluid Motion* competition!

Students are encouraged to capture images of fluid flow as they go about their day-to-day activities (milk in coffee, cloud formations, waves while surfing etc.) and post them in the designated Dropbox on the D2L website, together with a brief description. You may also submit results from numerical simulations. **All submissions must be in the form of a single (10" x 7.5") powerpoint slide.** The students who provide the **top 5** entries (as judged by your peers) will receive 5% towards their grade and their lowest-scoring homework assignment will be discarded.

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. Other forms of academic dishonesty are equally unacceptable.

All USC students are responsible for reading and following the Student Conduct Code, which appears in the Scampus (<http://scampus.usc.edu/>).

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.

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://adminopsnet.usc.edu/department/department-public-safety>). This is important for the safety whole USC community. Another member of the university community – such as a friend, classmate, advisor, or faculty member – can initiate the report on behalf of another person. The Center for Women and Men provides 24/7 confidential support (<http://engemannshc.usc.edu/cwm/>), and the sexual assault resource center webpage describes reporting options and other resources (<https://sarc.usc.edu/>).