MAE101B: Advanced Fluid Mechanics Winter Quarter 2020

http://web.eng.ucsd.edu/~sgls/MAE294B_101B/

Course information

Times

'Lectures: MWF 10:00–10:50 am in WLH 2113. Fourth hour M 8:00–8:50 am in WLH 2113. Professor's meeting hours: e-mail me to take an appointment (I will be at SIO on Tuesdays and Thursdays); you can also see if I'm in my office, EBUII 574: if I'm not busy, I should be able to talk. TA: Asheesh Anand (asanand@eng.ucsd.edu), meeting hours: contact (e-mail, Piazza, etc.) to make an appointment; problem classes: M 4–5 pm, W 3–4 pm in EBU II 105.

Text

Fundamentals of fluid mechanics by Munson, Okiishi, Huebsch and Rothmayer, 8th edition, Wiley.

Homework

Homework policy: you may discuss problems among yourselves, but you should write up and hand in homework individually. Homework should be handed in during class on Wednesday or ahead of time to the TA if you have made arrangements. No late homework will be accepted.

Work should be single-sided on new clean paper, stapled together. Print name, date, course and homework number on the first page; box final answers, especially for problems with multiple parts. Illegible homework will be returned ungraded. Solutions will be placed on the website after the due date.

Here is a suggested standard format (sample solution).
Problem Description. Basic description and given information. Sketch of problem/geometry and system considered (dashed lines for system). Initial state (knowns and unknowns). Final state (knowns and unknowns). Appropriate property diagrams (state points, process lines). What is to be determined.
Engineering Model. List all required simplifying assumptions and idealizations.
Basic Equations. General form of all relevant fundamental laws, equations, definitions.
Analysis. Clear description of procedure to reduce basic equations to solution. Keep equations in variable forms as long as possible before using numbers. Identify all tables and charts needed for additional data and property values. Clearly indicate final answers with box. Check solution: correct sign, reasonable numerical values?
Discussion of Solution. As needed (what you learned, key aspects of solution, etc...)

I do not insist on the entire format's being used: in particular sketching the problem and writing down given information will not lead to points. However you should use an equally clear format.

Grades will be determined by your understanding of the problem, identification of the procedure to obtain the solution, clear and precise description of the solution, and correct numerical answers.

Requests for regrades must be submitted in writing to me within a week of getting the homework back, with a justification for the regrade. Include name, date, e-mail address.

Quizzes

There will be four 50-minute quizzes. There will be no make-up quizzes. All quizzes are closed book. Bring pencil and calculator to all exams.

Midterm

There will be one open-note midterm on Wednesday February 12. There will be no make-up midterm. Bring pencil, calculator and paper. The midterm will cover all the material lectured up to and including TBD.

Final

The final will be on Monday March 16, 8–10:59 am. A make-up exam will only be provided for medical reasons with proper documentation from a physician. The final will cover the material lectured during the course and will be open book.

Grading

Method A: Curve based on: Homework 10%, 3 best of 4 quizzes 15%, midterm 30%, final 45%

Method B: Absolute scale based on final: A $>$ 80%, B $>$ 70%, C $>$ 55%, D $>$ 40%.

Your grade will be computed by methods A and B and you will receive the higher of the two. I may rescale the different components (homework, quizzes, final) separately to arrive at the final grade. I do not recommend planning on Method B from the beginning. Method A is more reliable.

Cheating

I remind you of UCSD's policy on academic integrity. Action will be taken in cases of cheating. Don't make it happen to you.

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Research interests:

Fluid dynamics. Acoustics and fluid-structure interactions. Asymptotic methods. Industrial mathematics.

Interests:

Japanese; cocktails; rowing; the oceans.

Education:

• Queens' College, University of Cambridge, 1993–Oct 1996. PhD 1996.

• Massachusetts Institute of Technology and Woods Hole Oceanographic Institution, 1992–1993.

• Queens' College, University of Cambridge, 1988–1992. Certificate of Advanced Study (Part III of the Mathematical Tripos) with Distinction, 1992. BA (Honours) First Class (Parts IA, IB & II), 1991.

Some recent publications:

Llewellyn Smith, S. G., Chang, C., Chu, T., Blyth, M., Hattori, Y. & Salman H. 2018 Generalized contour dynamics: a review. Reg. Chaotic. Dyn., 23, 507–518.

Chang, C. & Llewellyn Smith, S. G. The motion of a buoyant vortex filament. J. Fluid Mech., 857, R4.

Matusik, K. E. & Llewellyn Smith, S. G. 2019 The response of surface buoyancy flux-driven convection to localized mechanical forcing. Experiments in Fluids, 60, 79.

Llewellyn Smith, S. G. & Luca, E. 2019 Numerical solution of scattering problems using a Riemann–Hilbert formulation. Proc. R. Soc. A, 475, 20190105.

Llewellyn Smith, S. G. & Hattori, Y. 2019 Generation of bulk vorticity and current density in current-vortex sheet models High Energy Density Physics, 33, 100712.

Zhang, Y. Llewellyn Smith, S. G., Zhang, T. & Lia, T. 2019 A Lagrangian approach for computational acoustics with particle-based method. Engineering Analysis with Boundary Elements, 108, 459–471.

Rocha, C, Bossy, T., Llewellyn Smith, S. G. & Young, W. R. 2019 Improved bounds on horizontal convection. Accepted by J. Fluid Mech.

Lahaye, N. & Llewellyn Smith, S. G. 2019 Modal analysis of internal wave propagation and scattering over large-amplitude topography. Accepted by J. Phys. Oceanogr.

Wu, Y., Llewellyn Smith; S. G., Rottman, J. W., Broutman; D. & Minster, J.-B. H. 2019 Time-Dependent Propagation of Tsunami-Generated Acoustic-Gravity Waves in the Atmosphere. Accepted by J. Atmos. Sci.

Chang, C. & Llewellyn Smith, S. G. 2019 Axisymmetric contour dynamics for buoyant vortex rings. Accepted by J. Fluid Mech.