

MAE 210B – FLUID MECHANICS II
SPRING 2017

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Lectures: Monday, Wednesday, Friday 8:00-8:50am

Office Hours: Monday 10:00am-11:00am, Wednesday 10:00am-11:00pm, EBUII 554

Text Book: *Fluid Mechanics*
Kundu, Cohen, Dowling, Elsevier

Grading: Homework: 20%, 2 take-home midterm exams: 20% + 20%, Final exam: 40%

Topics

1. Review of the Navier-Stokes equations. The Reynolds number.
2. The Euler equations. Quasi-steady flow. The vorticity equation.
3. Potential flow. Gravity waves.
4. Planar potential flow. Simple analytic functions. Flow over a circular cylinder. Conformal mapping. Joukowski transformation. Schwartz-Christoffel transformation.
5. Unidirectional flow. Poiseuille and Couette flow. Rayleigh problem. Stokes second problem. Viscous flow in channels.
6. Thin film theory. Hydrodynamic lubrication. Adhesion forces. Free-surface films.
7. Stokes flow. Flow over a sphere. Flow over a cylinder. Creeping flow in corners.
8. The boundary-layer approximation. Blasius problem. BL thickness. Integral equation. Karman-Pohlhausen method. BL separation. Jets and Wakes. Higher-order BL theory.

ADDITIONAL BIBLIOGRAPHY:

- An introduction to Fluid Dynamics. G. K. Batchelor. Cambridge University Press. 1967.
- Fluid Mechanics. L. D. Landau & E. M. Lifshitz. Pergamon Press. 1989.
- Laminar Flow Theory. P. A. Lagerstrom. Princeton University Press. 1996.
- Elementary Fluid Dynamics. D. J. Acheson. Clarendon Press. 1990.