

SYLLAB US

1. Number and Name: 16:180:586 – ADVANCED FLUID MECHANICS

2. Credits and contact hours: 3 credits, 80 min. lecture periods per week

3. Instructor: Roger Wang

4. Text: Fischer, H. B., List, J. E., Koh, C. R., Imberger, J., & Brooks, N. H. (1979). *Mixing in inland and coastal waters*. Academic press.

Reference: Schlichting, H., Kestin, J., & Street, R. L. (1980). *Boundary-layer theory*.

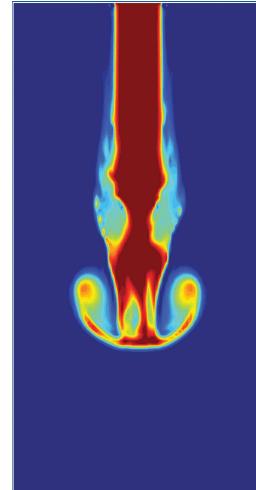
Tennekes, H., Lumley, J. L., & Lumley, J. L. (1972). *A first course in turbulence*. MIT press.

5. Specific Course Information

a. Catalog Description: This class is designed to introduce the application of fluid mechanics to problems of pollutant transport, mixing in the water environment, harnessing water power, and problems related to the students' research. Mathematical models of advection, diffusion, and dispersion will be introduced in depth. The emphasis of the class will be on the connection between theory and problems of transport and mixing in rivers, estuaries, and lakes and reservoirs.

b. Prerequisites:

c. Course Type: Graduate Class



6. Course Goals

Students will learn the basic and applicable fluid dynamics, including the derivation of the equations and the analytical solution to classical flow problems. Student problem solving skills will be enhanced through the use of homework projects and a term project involving developing analytical analysis to the selected topic. Student research and communication skills will be refined by research paper and oral presentation (15-20 minutes) requirements.

7. Topics

- 1 Course Introduction; Governing Equation
- 2 Turbulence and Diffusion
- 3 Shearing Flow Basics

- 4 Mixing in River and Lakes
- 5 Tidal Dynamics in Estuaries
- 6 Jets and Plumes
- 7 Boundary Layer Theory
- 8 Micro- and Nano- Flow
- 9 Multiphase Flow
- 10 Fluid-Structure Interaction
- 11 Other Flow Topics

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| Grading: | Reading Homework | 40% |
| | Term Paper | 30% |
| | Project Presentation | 30% |

Prepared by: Roger Wang 08/16/20