MECH 586: Turbulent Shear Flows

Lectures:	Mon. 18:00 – 21:00 CEME 1210
Instructor:	**W. Kendal Bushe**
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Grading:	Term paper: 30%
	Quizzes: 20%
	Final: 50%
Text:	Pope, S. B. (2000) "Turbulent Flows", Cambridge University Press.

Course Synopsis

In this course, we will be teaching the fundamentals of turbulent flows. We will begin by covering the basic equations of fluid motion; then we will discuss the statistical description of turbulent flows and the significance of scales. We will discuss wall-bounded and free shear turbulent flows. We will then cover the simulation and modelling of turbulence, including major models for the simulation of turbulent flows. We will conclude discussing some advanced topics where the ideas presented before find application in real-world applications.

As a prerequisite, students must have a basic undergraduate understanding of fluid mechanics. Undergraduates and students from outside of Mechanical Engineering should confirm with the instructor that they have appropriate preparation for the course.

A portion of the course grade will be for a "term paper" on a subject chosen by the student (subject to approval by the instructors). The grade for the term paper will be based with equal weighting on a written report and an oral presentation to be given in the last week of classes in the term. The written report will be due at the final exam (time TBA).

Outline by Lecture Period

Date	Topic
Jan. 6	Introduction & Governing equations
Jan. 13	Statistics
Jan. 20	Scales, the Energy Cascade & Coherent structures
Jan. 27	**Quiz 1**
Feb. 3	Jets
Feb. 10	**No class: Family day!**
Feb. 17–21	**No classes for "Reading" break**
Feb. 24	Other free-shear flows & Channel flows
Mar. 3	Pipe flow & Turbulent Boundary layers
Mar. 10	Direct Numerical Simulation & Turbulent viscosity models
Mar. 17	Reynolds stress models & Large Eddy Simulation
Mar. 24	**Quiz 2**
Mar. 31	PDF transport models & Experimental techniques for turbulent flows
Apr. 7	Student presentations