King Fahd University of Petroleum & Minerals
MECHANICAL ENGINEERING DEPARTMENT
ME 632 : ADVANCED FLUID MECHANICS II
Spring Semester 2005-2006 (052)

Instructor: **Dr. S. Z. Shuja**   **Office: 22-216;**   **Phone: 4465**

Textbook: Tennekes, H. and Lumley, J. L. **A FIRST COURSE IN TURBULENCE**. The MIT press, 1972.

References: 1) Schlichting, H. **Boundary layer theory**.
                2) Batchelor, G. K. **The theory of homogeneous turbulence**.
                3) Hinz, J. O. **Turbulence**.
                4) Reynolds, A. J. **Turbulent flow in Engineering**.
                5) White. F. M. **Viscous Fluid Flow**.
                6) Bradshaw, P. **Turbulence**.
                7) Wilcox, D. C. **Turbulence modeling for CFD.**

Course Description: Stability of laminar flow and causes of transition to turbulence. Conservation equations and Reynolds stresses. Turbulent boundary layer equations, integral and other methods of solution. Free turbulence, wakes and jets. Statistical analysis; scales of turbulence, correlation functions, spectra. Measuring techniques.
Prerequisites: ME 532.

Goals: This course is designed to introduce the basic engineering concepts of turbulence and various methods to model the turbulent fluid flow process. The aim is to present in a rational way the methods of predicting turbulent flows used in engineering practice. This will be achieved by developing a realistic picture of the processes within turbulent flows, and by introduction of appropriate terminology and analytical techniques. Thus the student is prepared to approach the specialist literature of the subject with some confidence.

Material to be covered:

Week (2 classes)	Topics
1,2	Introduction to turbulence and it's properties.
3	Revision of conservation principles and relevant mathematics.
4,5	Reynolds equation for turbulence and Reynolds stresses.
6,7	Channel and pipe flows.
8,9	Turbulent boundary layer flows.
10,11	Free turbulence, jets, wakes and mixing layers.
12,13	Introduction to turbulence modeling.
14,15	Statistical analysis of turbulence and measuring techniques.

Evaluation:

Major Exam 1	20%
Major Exam 2	25%
Term Project	10%
Homeworks	15%
Final Exam	30%

Attendance: Attendance will be strictly observed and each absence will result in a deduction of 0.5 % of the final grade.

Homework: Home-works will be regularly assigned to enhance the understanding of concepts discussed in the class.