King Fahd University of Petroleum & Minerals

MECHANICAL ENGINEERING DEPARTMENT

ME 425 : COMPRESSIBLE FLUID FLOW

Spring Semester 2007-2008 (072)

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

Textbook: **COMPRESSIBLE FLUID FLOW, 2nd ed.,** M. A. Saad, Prentice-Hall, 1995.

References: **1. GAS DYNAMICS** by M. H. Aksel and O. C. Eralp, Prentice Hall, 1993.
2. GAS DYNAMICS, 2nd ed., by J. E. A. John , Allyn and Bacon, Inc. 1984
3. THE DYNAMICS AND THERMODYNAMICS OF COMPRESSIBLE FLUID FLOW by A. H. Shapiro

Course Description:
Fundamentals of compressible fluid flow (gas dynamics) in relation to effects of area change (nozzles and diffusers), friction and heat interaction (Fanno, Rayleigh line and isothermal flow), combustion waves (deflagration, explosion and detonation waves), normal and oblique shock waves and their effects on flow properties (extended diffusers and supersonic airfoils). Applications to flow through pipelines, subsonic, sonic and supersonic flights, turbomachinery and combustion.
Prerequisites: ME 311

Material to be covered:

Week	Classes (50 min)	Chapters	Topics
1	3	1	Introduction to Properties.
2	6	2	Equations of flow.
3,4	9	3	Isentropic flow.
5,6,7	9	4	Normal shock waves.
8,9,10	6	5	Adiabatic frictional flow in
11,12	9	6	ducts.
13,14,15	3	7	Flow with heat interaction.
			Two dimensional waves.

Evaluation:

Quizzes	15%	
Major Exam 1	15%	**25th Mar. 2008 (8:00-10:00pm)**
Major Exam 2	25%	**6th May 2008 (8:00-10:00pm)**
Design Project & Assignments	10%	Dates will be announced in the class
Final Exam	35%	

Attendance:
University regulations on attendance will be strictly enforced.

Design Project & Homework: Each student must submit the assigned design project and his homework on time (no late homeworks will be accepted). All homeworks solutions should have the Department standard cover sheet in the front.

Homework	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Problem # ***(from textbook)***	1.3, 1.10, 1.15, 1,18	2.4, 2.9, 2.16, 2.22, 2.24	3.4, 3.11, 3.13, 3.18, 3.26	4.5, 4.12, 4.16, 4.20, 4.30	5.2, 5.7, 5.8, 5.12, 5.18, 5.21	6.5, 6.11, 6.15, 6.21, 6.27	7.2, 7.5, 7.9, 7.12, 7.22, 7.24