

Western Michigan University
Department of Industrial and Manufacturing Engineering
IME 2840 (Fluid Mechanics and Hydraulics)
Spring 2008

Instructor: Alamgir A. Choudhury
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Class: TR 11:30AM - 12:20PM, CEAS-D201
Office hours: TR9:00 – 11:00 AM

Catalog Description: Fluid properties, fluid statics, laminar and turbulent flow, flow in pipes.

Objective:

1. Characterize fluids by properties and identify ideal and non-ideal fluid dynamic situations (a)
 2. Solve problems related to static interaction fluid-structure (a,e)
 3. State, explain and apply the concepts of balance of mass and energy (a,e)
 4. Calculate frictional losses in piping systems (a,e,k)
 5. Demonstrate understanding of the Energy Equation by implementing it in a computer program. (a,c,e,g,k)
- (Letter in parenthesis refers to the ABET-TAC criteria)

Text (required):

Mott, R. L., *Applied Fluid Mechanics*, 6th edition, Pearson Prentice Hall, Inc., Upper Saddle River, NJ, 2006.

References (optional):

Esposito, A., *Fluid Power with Applications*, 6th edition, Prentice Hall, 2003

Prerequisites:

1. Understanding of concepts of mass, pressure, temperature, and mass/energy balance (**PHY1130/1140**)
2. Understanding of principle of equilibrium (**IME2810**)

Evaluations: Grade in this class will be based on a modified class average according to the following schedule. A minimum of 60% is required to receive a passing grade in this course.

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| 1. Homework and computer assignment | (25%) |
| 2. Quizzes | (10%) |
| 3. Exam 1 | (20%) |
| 4. Exam 2 | (20%) |
| 5. Final Exam | (25%) |

Performance Criteria:

The student should be able to:

1. Define and convert units of fluid properties (1, 3, 4, 5)
2. Develop solving methodology based on flow type (1, 2, 3, 5, 6)
3. Identify and solve given fluid static problems (1, 3, 5, 6)
4. Identify different types of energies in fluid problems (1, 3, 4, 5, 6)

5. Apply Continuity Equation and Bernoulli Equation (1, 2, 3, 4, 5, 6)
 6. Apply equations, tables and graphs to calculate losses (1, 2, 3)
 7. Perform what if scenarios to textbook problems (3, 5, 6)
- (Number in parenthesis refers to the evaluation method)

Exams: One hour exam in class time

Quizzes: 5 –10 minutes quizzes at the beginning of class once every week. Quiz date may not be announced in advance. There is no make up for the missed quizzes.

Homework:

Generally 3 – 4 problems will be assigned per class. It is due at the beginning of next Tuesday’s class. Late homework grades will be reduced by 10% per day. No late work will be accepted after the assignment is already graded. Irrespective of study habit, all work submitted should be done individually. This class will be conducted on an interactive basis, i.e., during discussion of concepts, applications and problems, student participation is expected. Attendance and punctuality in the class is important.

Computer Assignment:

One assignment will require use of a high level programming language (C++, Visual Basic, etc.) or Excel. A written report in specified format is required for this assignment.

Evaluation:

For the purpose of assigning the letter grade, the following scale will be used.

<u>Grade</u>	<u>Range</u>
A	90 – 100
B/A	88 – 89.9
B	80 – 87.9
C/B	78-79.9
C	70 – 77.9
D/C	68 – 69.9
D	60 – 67.9
E	Below 60

Academic Honesty: You are responsible for making yourself aware of and understanding the policies and procedures in the Undergraduate and Graduate Catalogs that pertain to Academic Honesty. These policies include cheating, fabrication, falsification and forgery, multiple submission, plagiarism, complicity and computer misuse. [The policies can be found at www.wmich.edu/catalog under Academic Policies, Student Rights and Responsibilities.] If there is reason to believe you have been involved in academic dishonesty, you will be referred to the Office of Student Conduct. You will be given the opportunity to review the charge(s). If you believe you are not responsible, you will have the opportunity for a hearing. You should consult with me if you are uncertain about an issue of academic honesty prior to the submission of an assignment or test.

Course Schedule:

<u>Week</u>	<u>Topic</u>	<u>Chapter</u>
1 (Jan. 8, 10)	Introduction, Units and dimensions	1
2 (Jan 15, 17)	Fluid properties	1, 2
3 (Jan 22, 24)	Fluid viscosity	2
4 (Jan 29, 31)	Fluid pressure and force	3
5 (Feb. 5, 7)	Fluid pressure and force	4, 5
	Exam 1 (ch. 1, 2, 3, 4, 5)	
6 (Feb. 12, 14)	Fluid flow and Bernoulli's equation	6
7 (Feb. 19, 21)	Fluid flow and Energy Equation	7
8 (Feb. 26, 28)	Energy Equation	7
9 (Mar. 4, 6)	Spring Break – No classes	--
10. (Mar. 11, 13)	Nature of flow and friction losses	8, 9
11 (Mar. 18, 20)	Energy loss in system	9
	Exam 2 (ch. 6, 7, 8, 9)	
12 (Mar. 25, 27)	Energy loss in system	9, 10
13 (Apr. 1, 3)	Energy loss in system	10, 11
14 (Apr. 8, 10)	Hydraulic pumps	13
15 (Apr. 15, 17)	Fluid power applications and review	Handout
April 23, 10:15 AM – 12:15 PM	Final Exam	Comprehensive (1-11, 13)