

**Western Michigan University**  
**Engineering Design, Manufacturing and Management Systems**  
**EDMM 3840 (Fluid Mechanics and Hydraulics)**

**Catalog Description:** Fluid properties, fluid statics, fluid dynamics, friction loss and fluid power system. Laboratory practices on hydraulic system behavior and fluid power applications.

**Objective:**

1. Learn fluid properties and usage in fluid power industry
2. Understand fundamental concepts in fluid statics, fluid dynamics and energy balance, and apply them to solve problems in fluid flow applications
3. Understand features, components and function of basic fluid power systems
4. Learn to develop and test characteristics of specified fluid power systems in the lab
5. Develop analytical skills necessary for solving fluid power system design and analysis problems

**Text (required):** Mott, R. and Untener, J., *Applied Fluid Mechanics*, 7<sup>th</sup> edition, Pearson Prentice Hall, Inc., Upper Saddle River, NJ, 2015.

**References (optional):** Esposito, A., *Fluid Power with Applications*, 7<sup>th</sup> edition, Prentice Hall, 2009

**Prerequisites:**

1. Understanding of concepts of mass, pressure, temperature, and mass/energy balance (**PHY1130/1140**)
2. Understanding of principle of equilibrium (**EDMM 2810**)

**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 (D) in this course.

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|----------------------------|-------|
| 1. Homework                | (15%) |
| 2. Quiz                    | (5%)  |
| 3. Midterm                 | (20%) |
| 4. Final Exam              | (30%) |
| 5. Lab exercise and report | (30%) |

**Evaluation:**

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

<b><u>Grade</u></b>	<b><u>Range</u></b>
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

**Performance Criteria:**

The student should be able to:

1. Use proper units to calculate fluid properties (1,2,3,4,5)
2. Develop problem solving methodology based on nature of fluid flow (1,3,4)
3. Use theoretical equations along with tables and graphs to solve problems (1,3,4)
4. Calculate and specify design parameters of basic fluid power system (1,3,4,5)
5. Analyze performance of basic fluid power system (1,3,4,5)
6. Measure and interpret fluid flow characteristics (1, 3, 4, 5)  
(Number in parenthesis refers to the evaluation method)

**Midterm:** 2 hour exam – will include both lecture and lab topics.

**Quizzes:** 5–10 minute 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 5–6 problems will be assigned per class. It is due at the beginning of next 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.

**Laboratory Assignment:**

Laboratory classes will meet separately according to schedule and laboratory practice handout will be provided prior to each lab.

**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 <http://catalog.wmich.edu> 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 your instructor if you are uncertain about an issue of academic honesty prior to the submission of an assignment or test.

**Course Schedule:**

<b><u>Week</u></b>	<b><u>Topic</u></b>	<b><u>Chapter</u></b>
1	Introduction, Units and dimensions <i>No lab</i>	1
2	Fluid properties <i>Lab -1 &amp; 2</i>	1, 2
3	Fluid viscosity <i>Lab - 1 &amp; 2</i>	2
4	Fluid pressure and force <i>Lab - 3 &amp; 4</i>	3
5	Fluid pressure and force, fluid flow <i>Lab - 3 &amp; 4</i>	4, 6
6	Fluid flow and Bernoulli's equation <i>Lab - 5 &amp; 6</i>	6
7	Fluid flow and Energy Equation <i>Lab - 5 &amp; 6</i>	7
8	Nature of flow and friction losses <b>Midterm: March 2 (Ch. 1- 7)</b>	8, 9
9	Spring break – no classes	--
10	Energy loss in system <i>Lab - 7 &amp; 8</i>	9, 10
11	Energy loss in system <i>Lab - 7 &amp; 9</i>	10, 11
12	Fluid power system and components <i>Lab - 9 &amp; 10</i>	13, handout
13	Pumps and motors <i>Lab - 9 &amp; 10</i>	13, handout
14	Pressure, flow and direction control <i>Lab makeup and discussion</i>	Handout
15	Fluid power circuits, applications and review <i>No lab</i>	Handout
16	<b>Final Exam</b>	