

IVDL and Elluminate Instruction
From North Central State College

CREDIT HOURS: THREE (3)

PREREQUISITES BY COURSE: ENT 271 (Statics) and MTH 151 (Calculus I)

DESCRIPTION OF COURSE

The course emphasizes the application of fluid statics and fluid dynamics computational methods in the analysis of fundamental engineering fluid mechanics problems. The one-dimensional energy and momentum equations are introduced and applied to the solution of fluid flow problems.

A key part of the course is knowing the appropriate assumptions to make in solving fluid problems. Recognize that much of the process data – flow rates, friction factors, etc - in chemical plants and around the home are at best + or – 10%, it makes little sense to spend your time or company resources on details that will change your answers less than 10%.

OBJECTIVES OF COURSE

Upon completion of the course, students will have a basic understanding of :

- 1) the application of fluid statics to the solution of simple fluid mechanics analysis problems.
- 2) the application of conservation of mass, energy, and momentum equation to the solution of simple fluid mechanics analysis problems.
- 3) fluid measurement techniques

The student will demonstrate his/her understanding of these basic concepts by the level of performance on written homework, laboratory projects, tests, and examinations.

DESCRIPTION OF THIS DISTANCE LEARNING COURSE:

- A. Class meets Monday evening, 6 pm to 9:40 pm at multiple locations: North Central State (Mansfield, OH), Shawnee State (Portsmouth), Rhodes State (Lima), Zane State, (Zanesville) Washington State (Marietta, OH) and Columbus State (Columbus, OH) are probable distance sites. The locations will be connected together by video cameras and audio equipment.
- B. The videoconferencing hookup will be established one half hour before class begins to enable students to ask questions prior to class. An Elluminate session will also be established which all students are encouraged to connect to, and will be recorded.
- C. The instructor may broadcast from sites other than North Central if deemed necessary during the semester.

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- D. Laboratory projects during class will be handled in various ways depending on the type of project and availability of laboratory equipment. Some projects do not require hands-on participation of all students: students can record data from a distance by watching the camera zoom in on the gages. Most labs will be performed independently at one's home.

INSTRUCTOR:

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TENTATIVE SCHEDULE – See Website for dates and homework

- Week 1** (Chapters 1 & 2) SI and US units, The Nature of Fluids, Viscosity of Fluids
Week 2 (Chapter 3) Pressure and its Measurement; **Viscometer Lab**
Week 3 (Chapter 4) Forces on Submerged Surfaces
Week 4 (Chapter 5) Buoyancy and Stability
Week 5 1ST EXAM & (Chapter 6) Flow of Imaginary Fluids (i.e., zero viscosity) with no energy addition or subtraction (via pumps or turbines respectively)
Week 6 (Chapter 6 continued)
Week 7 (Chapter 7) Flow of Real Fluids (i.e., have viscosity) with energy addition or subtraction (via pumps or turbines respectively)
Week 8 (Chapter 7 continued)
Week 9 (Chapter 8) Laminar and Turbulent Flow, Reynolds number to characterize
Week 10 Spring Break
Week 11 (Chapter 9) Estimating frictional losses in a single pipe (no valves, bends, etc.).
Week 12 (Chapter 10) Estimating the frictional losses of valves, bends, etc in the pipe and Flow Measurement (Chapter 15).
Week 13 2nd EXAM. (Chapter 11)

Week 14 (Chapter 11) Estimating frictional losses for pipes in series (Chapter 11) frictional losses through pipes in parallel (Chapter 12).

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Week 15 (Chapter 13) Pump Selection and Application.

Week 16 (Chapter 16) Forces Exerted by Fluids in Motion
and Drag and Lift (Chapter 17)

Week 17 FINAL EXAM

TEXT MATERIAL:

Mott, Robert L, Applied Fluid Mechanics, 6th Edition, Prentice Hall, 2000.
ISBN: 0-13-114680-7

REFERENCES:

Schaum's Outline Series, Fluid Mechanics and Hydraulics, 3rd Edition, McGraw Hill

PREREQUISITES:

Simple differential and integral calculus; basic concepts of static equilibrium; concepts of work, energy, and momentum; and fundamental engineering technology problem solving skills.

COMPUTER USAGE:

Some homework assignments and laboratory projects may include the use of Microsoft Word, Microsoft Excel, AutoCad™ and QuickBASIC™ or C.

METHOD OF PRESENTATION

Typical class will alternate between lecture and practice problem solving. Approximately every other week time we will also spend time on a laboratory project instead of practice problem solving

METHOD OF EVALUATION

The course will be based on the following:

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| 1. Laboratory Projects and Homework | 25% |
| 2. 2 Midterm Exams | 50% |
| 4. Final Examination | 25% |

POLICIES ON GRADING HOMEWORK, QUIZZES, ETC.

- a) Consider a problem that requires calculations. You must show all your calculations work and obtain the correct answer to get full credit. A right answer alone with no supporting work obtains only partial credit. Likewise, you obtain partial credit if your answer is NOT in the units requested in the problem.

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b) **Partial Credit Scale:**

- No credit for skipping entire problem
- 20% credit for tried and went short way with the wrong approach
- 40% credit for tried and went long way with the wrong approach
- 60% credit for tried and went short way with the correct approach. *Or got the correct answer but did no show how you arrived at the answer*
- 80% credit for tried, almost finished with correct approach or finished but made mistake on the way (wrong decimal, wrong conversion factor, wrong units)
- 100% credit for showing the correct methodology to solve the problem.

A. **Course Web Site:** www.ekegrens.com

B. **Handing in homework, quizzes, labs, etc:** Hand in, FAX or e-mail to instructor or technician present at your location. Homework is due one week after assigned, labs are due two weeks after data is taken. **BE SURE TO FAX WITH A COVER PAGE TO MY ATTENTION.** Please send homework to my Miami address: ekegrekj@muohio.edu

C. **Handouts:** Always posted on our web site. May also be handed out in class.

D. **Solutions to homework, etc.:** **Solutions will be posted on the website after their due date. Study these solutions carefully.**

E. **Returning graded homework, quizzes, etc:** Hope to have done for you to pick up the next class period. This next class is also when we announce the average class score, discuss common mistakes noticed while grading, and answer questions about solutions.

F. **Office Hours are Monday, 3 – 5 pm, Tuesday and Thursday, 9 to 10 am. Feel free to call during this time. E-mail any questions at any time.**

G. Open Book Policies

1) Midterms and Final

- a. Unless otherwise announced, the exams will be open notes and textbook.