Course: CE/ME 319—Fluid Mechanics Laboratory  
Room: ET 341 and ET 343  
Time: Wednesday 9:00-11:50 am  
Web: http://www.etcs.ipfw.edu/~mueller

Instructor: Afure Akohwarien  
Office: ET 343  
Hours: Tuesday 4:30 pm - 5:30 pm  
Email: akoha01@students.ipfw.edu

Prerequisite: CE/ME 318

Description: Introduction to fluid mechanics laboratory and design of experiments, including experiments on flow patterns, velocity profile in an air pipe, wind tunnel calibration, draining of a tank, pipe friction, drag forces, boundary-layer studies, falling-ball experiments, and measurements of fluid properties.

Text: Fluid Mechanics Laboratory Manual  
Experiments will be posted at http://www.etcs.ipfw.edu/~mueller.

Attendance: Attendance in the lab is mandatory. You will not be allowed to submit a report if you do not participate in the experiment. Arrangements will be made for excused absences; please inform the instructor ahead of time if possible.

Reports: A report is required for every experiment. Reports typically will be due two weeks after the experiment is completed, unless otherwise specified. Experiments are performed as a team, but most reports are individual and must be your own work, i.e., copying is not allowed. If your report is identical to another report, you will receive at zero. The format for the report is outlined in the provided handout. Your grade will depend on the adherence to this format, and a grading rubric will be provided. Each lab report is worth 100 points; points for other assignments will be specified.

Design of Experiment: At least one lab will involve an activity in which student teams will design an experiment that relates fluid mechanics theory with laboratory experiment. This activity will require students to select equipment, perform uncertainty analysis, predict expected outcomes, write a detailed procedure, perform the experiment, and analyze and discuss results.

Grades: Each lab will be graded based on the criteria outlined in the handout and the sample grade sheet. In addition to technical content, reports will be graded on appearance, neatness, grammar, and spelling. Late reports will penalized 10% for each day late. No reports will be accepted after one week past the due date.

Grades will be assigned in accordance with the following criteria:

\[ A \geq 90\%, \ 89\% > B \geq 80\%, \ 79\% > C \geq 70\%, \ 69\% > D \geq 60\%, \ F < 59\% . \]
Academic Honesty

Academic honesty is expected of all students. All assignments are to be individual work unless otherwise specified by the instructor. Plagiarism and copying are not acceptable. An instance of academic dishonesty may result in failure of the assignment, a grade of F for the course, or dismissal from the university.

Lab Safety

Your safety is of the utmost importance to the University. Currently, the Department of Civil and Mechanical Engineering is working through a process to bring all of our lab’s up-to-date and meet all safety standards set forth by both OSHA and Purdue University. In the process of obtaining certification, it is important that we provide training for all individuals who will be working in the lab. For this reason, you will be required to take a brief safety training before you will be allowed to enter the lab space for class. After the training you will take a quiz—you will not be able to participate in any lab activities until you pass this quiz.

Safety glasses are required in the lab room. Sunglasses and vision glasses are not adequate. You will not be allowed to participate or receive a grade without wearing safety glasses or goggles. Be careful of hot surfaces and liquids, glass equipment, chemicals, and electricity. In case of an accident, remove yourself from any dangerous situation, inform your instructor immediately, and call IPFW Police and Safety with the red phone in the lab if necessary.

Comments

Eating and drinking are not allowed in the computer lab. If you do carry a drink, it should have a lid and please be careful.

As a courtesy to the instructor and other students, do not be late for class and turn off your cell phone.

Some course communication may be through email. Please check your email regularly for class schedule or assignment updates.

Consult the student handbook for information pertaining to the grade appeal or grievance policies.

Many services are available to students. The Center for Academic Support and Advancement (CASA) offers tutoring in KT G23. Personal Counseling Services (373-8060) are available to students in Walb 210. Students with a disability in need of assistance should contact the SSD office in Walb 113 (481-6658 or www.ipfw.edu/ssd) for a description of services available.

Please feel free to stop by any time if you have any comments or suggestions. I truly am interested in what you think about the course. Any suggestions that will benefit the class are appreciated, and I will try my best to address any concerns that you might have.

If you do not feel comfortable discussing matters with me, feel free to speak to Dr. Nash Younis, Chair of the Department of Civil and Mechanical Engineering.

†These are maximum cut-offs.
CE/ME 319—Fluid Mechanics Laboratory

Course Outcomes

A student who successfully fulfills the course requirements will be able to:

1. Identify, name, and characterize flow patterns and regimes. (a)
2. Understand basic units of measurement, convert units, and appreciate their magnitudes. (a)
3. Utilize basic measurement techniques of fluid mechanics. (a)
4. Discuss the differences among measurement techniques, their relevance and applications. (h, i)
5. Measure fluid pressure and relate it to flow velocity. (k)
6. Demonstrate practical understanding of the various equations of Bernoulli. (k)
7. Demonstrate practical understanding of friction losses in internal flows. (k)
8. Demonstrate practical understanding of boundary layers, separation, drag, and lift. (k)
9. Demonstrate the ability to write clear lab reports. (g)
10. Use word processors, graphics packages, and computational software in writing. (g, i)
11. Prove good understanding of concepts and their applications in the laboratory. (a, g)
12. Compare the results of analytical models introduced in lecture to the actual behavior of real fluid flows and draw correct and sustainable conclusions. (a, k)
13. Demonstrate the ability to work in groups on small design projects that are appropriate to the course. (d, g)
14. Demonstrate the ability to produce a working model through hands-on experience in fluid mechanics design and explain its operation in terms of what was learned in the course. (a, b, c, e, g)
15. Understand ethical issues associated with decision making and professional conduct. (f)

Program Outcomes

Engineering programs must demonstrate that their graduates have:

(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design both thermal and mechanical systems, components, or processes to meet desired needs within realistic constraints such as economic, environmental, social, ethical, safety, manufacturability, and sustainability
(d) an ability to function on engineering and science laboratory and project teams as well as multi-disciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively in both verbal and written forms
(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice, including analysis and design.