



CE 218 Fundamentals of Fluid Mechanics

Spring 2019

Catalog Description: (3 units) Hydrostatics, continuity, irrotational flow, pressure distributions, weirs and gates, momentum and energy, surface drag, pipe friction, form drag, pipe fitting losses.

Prerequisite(s): CE 214.

Course Objectives: The course is taught to civil, agricultural, hydrologic, and geologic engineering students. As the first course in fluid mechanics, it aims to provide an introduction of fundamental principles governing fluid statics and dynamics and apply these theories to practical problems such as hydrostatics, open channel flow, and pipe flow. By the end of this course, the students should be able to

- Understand the definition of a fluid
- Understand the concepts of viscosity, surface tension, caterpillar, the difference of Newtonian and non-Newtonian fluids
- Understand the assumptions for ideal flow
- Understand the difference between laminar and turbulent flow and the transition between them, and know how to determine these flow regimes
- Able to calculate hydrostatic pressure on a plate or curved surface and locate the center of pressure
- Understand the principles of manometer and know about its applications
- Derive and apply the Bernoulli equation
- Derive and apply the one-dimensional momentum equation
- Understand major losses and minor losses, and know how to quantify them using the Moody diagram in pipe flow analysis

ABET outcomes:

Primary

1. Ability to identify and formulate, and solve engineering problems, and to apply mathematics, science and engineering principles

Secondary

3. Ability to communicate effectively with a range of audiences
4. Knowledge of contemporary issues

Instructor: Jennifer G. Duan, Ph.D., P.E.

Class time & place: MWF 10:00 – 10:50 am (Harvill Bldg 302)

Office Hour (instructor): Wednesday 11:00-2:00 pm at CE 210

Office: CE 210, Civil Engineering Building, 1209 E. 2nd Street. Voice: 626-5946

E-mail: gduan@email.arizona.edu

Teaching Assistant: Mr. Erfan Ghasemi Tousi

Discussion (TA): Monday (5:00-5:50 pm at Harvill 232), Wednesday (4:00-4:50 pm at Bio Science East 314), Friday (3:00-3:50 pm at CE Chavez Bldg 305).
Office Hours (TA): TBA
Office: CE 207, Civil Engineering Building, 1209 E. 2nd Street, Tucson, AZ 85721.
E-mail: erfang@email.arizona.edu

Textbook: “Fundamentals of Fluid Mechanics”, Munson, Young, and Okiishi, 5th, 6th, 7th edition. Other materials will be supplied through course D2L website

Website: <https://d2l.arizona.edu> (follow instructions to the CE218 site)

Evaluation (* for online students only)

Homework	8% (*10%)
Tests (3)	60% (20% each)
Final Exam	20%
Quiz	5%
Class responses	4% (*0%)
Attendance	3% (*5%)
Bonus**	2% (maximum)

** - 0.25% and 0.5% bonus will be given to each group member with an averaged test score in each test over 80 and 90, respectively.

Only one recitation is required and counted each week. Homework assignments will be posted at D2L site each Friday and will be due on the following Friday. No electronic submission is accepted. Late homework will receive 10% reduction per late day.

Exams will be given approximately at the scheduled dates stated in class calendar. Exams will be closed book but note card will be allowed with equations and short notes. Makeup exams will not be provided without an extreme situation for missing the scheduled exam.

COURSE SCHEDULE AND CONTENTS

The tentative schedule is listed as follows,

<i>Topic</i>	<i>Reading Material</i>
Characteristics of Fluids	Chap 1
Fluid Statics	Chap 2
Test 1: Chapter 1-2	
Fluid Dynamics: Bernoulli Equation	Chap 3.1; 3.2; 3.3
Applications of Bernoulli Equation	Chap 3.4; 3.5; 3.6; 3.7; 3.8
Flow Fields and Reynolds’ Transport Theorem	Chap 4.1; 4.2; 4.3; 4.4
Test 2: Chapter 3-4	
Conservation of Mass	Chap 5.1
Momentum and Moment of Momentum Eqs.	Chap 5.2

First Law of Thermodynamics - Energy Eq.
Similitude and Dimensional Analysis

Chap 5.3

Chap 7

Test 3: Chapter 5, 7

Laminar Pipe Flow

Chap 8.1; 8.2

Turbulent Pipe Flow

Chap 8.3

Flow Resistance in Pipes, Flowrate Measurement

Chap 8.4; 8.5

Final Exam: 60% Chapter 8 + 40% of the rest

10:30am -12:30pm, December 7th, Friday, 2018

Top Hat

We will be using the Top Hat (www.tophat.com) classroom response system in class. You will be able to submit answers to in-class questions using Apple or Android smartphones and tablets, laptops, or via text message (SMS).

You can visit <http://tinyurl.com/THStudentRegistration> for the Student Quick Start Guide which outlines how you will register for a Top Hat account, as well as providing a brief overview to get you up and running on the system. An email invitation will also be sent to your email account (if you don't receive this email, you can register by visiting our direct Top Hat course URL tophat.com/e/987583).

Top Hat will require a subscription. There are three options to choose from:

- \$24 for 4 months of unlimited access
- \$36 for 12 months of unlimited access
- \$72 for lifetime* access

Calculator Policy

Only the listed calculators are allowed in all the exams.

- **Casio:** All fx-115 and fx-991 models (Any Casio calculator must have “fx-115” or “fx-991” in its model name.)
- **Hewlett Packard:** The HP 33s and HP 35s models, but no others
- **Texas Instruments:** All TI-30X and TI-36X models (Any Texas Instruments calculator must have “TI-30X” or “TI-36X” in its model name.)

Academic Integrity

Principle Integrity and ethical behavior are expected of every student in all academic work. This Academic Integrity principle stands for honesty in all class work, and ethical conduct in all labs and clinical assignments. This principle is furthered by the student Code of Conduct and disciplinary procedures established by ABOR Policies 5-308 through 5-404, all provisions of which apply to all University of Arizona students.

This Code of Academic Integrity (hereinafter "this Code") is intended to fulfill the requirement imposed by ABOR Policy 5-403.A.4 and otherwise to supplement the Student Code of Conduct as permitted by ABOR Policy 5-308.C.1.

Failure to follow the code of academic integrity will result in failing the course and be reported to the Dean of Students' office.

Prohibited Conduct: Conduct prohibited by this Code consists of all forms of academic dishonesty, including, but not limited to:

- 1 Cheating, fabrication, facilitating academic dishonesty, and plagiarism as set out and defined in the Student Code of Conduct, ABOR Policy 5-308-E.6, E.10, and F.1
- 2 Submitting an item of academic work that has previously been submitted without fair citation of the original work or authorization by the faculty member supervising the work.
- 3 Violating required professional ethics rules contained or referenced in the student handbooks (hardcopy or online) of undergraduate or graduate programs, or professional colleges.
- 4 Violating health, safety or ethical requirements to gain any unfair advantage in lab(s) or clinical assignments.
- 5 Failing to observe rules of academic integrity established by a faculty member for a particular course.
- 6 Attempting to commit an act prohibited by this Code. Any attempt to commit an act prohibited by these rules shall be subject to sanctions to the same extent as completed acts.

Student Responsibility

Students engaging in academic dishonesty diminish their education and bring discredit to the academic community. Students shall not violate the Code of Academic Integrity and shall avoid situations likely to compromise academic integrity. Students shall observe the generally applicable provisions of this Code whether or not faculty members establish special rules of academic integrity for particular classes. Students are not excused from complying with this Code because of faculty members' failure to prevent cheating.