

CE 462 - Open Channel Hydraulics
MWF 2:30-3:20 – 73 Willard Building

Instructor: Dr. Norman D. Folmar, P.E.

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Office Hours: Mondays 10-12, Wednesdays 10-11, Fridays 10-12, and by appointment

Required Text: Sturm, T., Open Channel Hydraulics, 2nd Edition, McGraw-Hill

Prerequisite Requirements:

The prerequisite for this class is CE 360. You will be dropped from this course by the last day of the drop/add period (Wednesday, September 2) if your PSU record does not reflect that you have passed this requirement. Please contact me as soon as possible if you have any concerns regarding this requirement.

Open Channel Hydraulics draws heavily from Fluid Mechanics; we will use the conservation laws of classical mechanics to formulate and analyze a wide variety of interesting flow phenomena. Your familiarity with the material in CE 360 is assumed and will be essential to a satisfactory performance in CE 462. The review of this material during the first week of class will not be a replacement for this requirement.

Grading:	Homework	30%
	Midterm Exams (2)	50%
	Project	20%

Final grades will be based on the weighted-average specified above and assigned as follows:

- A = 94-100%
- A- = 90-93%
- B+ = 87-89%
- B = 84-86%
- B- = 80-83%
- C+ = 76-79%
- C = 70-75%
- D = 60-69%
- F < 60%

COURSE GOALS:

Enable you to understand and apply the fundamental principles governing open channel hydraulics to the design of engineering systems. Natural and engineered hydraulic systems affect many aspects of the physical world, and modern human conveniences (e.g., water supplies). This course represents a stepping stone in your professional development; it is intended to aid you in developing the skills you will need for systematic decomposition and solution of real-world problems.

ABET EDUCATIONAL OBJECTIVES:

- Gain a solid understanding of the basic principles of mathematics, science, and engineering.
- Be able to apply this understanding to advance your technical competency in Civil Engineering
- Be able to use the techniques, skills, and modern engineering tools learned in this course for practice in Civil Engineering and/or graduate education.

ABET EDUCATIONAL OUTCOMES:

- An ability to apply your knowledge of mathematics, science, and engineering.
- An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

HOMEWORK:

Homework will be assigned regularly and is due at the **beginning of class** on the due date. Late homework **will not** be accepted. All homework is to be done in pencil on regular-sized (8.5"x11") paper. Please use only 1 side of the paper. Present your homework **NEATLY** and in an **ORGANIZED** manner. Homework that is unclear will be returned ungraded. Each assignment is complete only if it has the following:

- Your name on each page of **stapled** solutions
- Provide a clear problem outline
 - Given information – summarize the problem including labeled diagrams
 - Objective of the problem – state the unknown that is sought
 - Solution - A legible step-by-step presentation of the solutions
- Boxed answers are to be presented in proper units

The grading of each homework problem (or significant part of a multi-part problem) will be:

- 3 points – Highest quality: assumptions and problem are well defined; problem solving method is clear and logical; the correct conceptual approach is used; a correct or nearly-correct final answer is presented. Minor mistakes (algebra, etc.) may result in full credit.
- 2 points – Satisfactory quality: problem statement is complete; the solution approach is generally correct, but may have inaccurate or missing minor elements; units are missing from your final answer; your final answer is not clearly identified.
- 1 point – Marginal quality: problem statement is incomplete and/or solving method is incomplete or not completely correct; work is illegible, unorganized or only marginally complete.
- 0 point – completely unacceptable. No substantive effort to solve the problem was made.

All homework assignments will have equal weight. Your lowest homework grade will be dropped. This is meant to account for any potential issues that you may encounter during the semester (illness, etc.) that keeps you from doing your absolute best every week.

EXAMS:

This class has 2 mid-term exams. All exams will be closed-book, with necessary equations and numerical constants provided. While calculators may be used, cell phones, blackberries, and other electronic devices are strictly prohibited. Makeup exams will only be given in the event of a documented illness or a family emergency. Arrangements for an alternate exam need to be made, when possible, prior to the scheduled exam date.

FINAL PROJECT:

The final four weeks of the semester will involve significant computer work (HEC-RAS and HEC-GEORAS). You will have several small tutorial-style homework assignments during this period and one involved project, which builds upon these assignments. This final project will be in lieu of a final exam in the class.

ACADEMIC INTEGRITY:

The College of Engineering's statement on academic integrity is available at <http://www.engr.psu.edu/CurrentStudents/acadinteg.aspx>. Please review this information as it provides details on what constitutes a violation of academic integrity, how violations are dealt with, and penalties for violations.

Special Fall 2009 Flu Protocols. In compliance with Pennsylvania Department of Health and Centers for Disease Control recommendations, students should NOT attend class or any public gatherings while ill with influenza. Students with flu symptoms will be asked to leave campus if possible and to return home during recovery. The illness and self-isolation period will usually be about a week. It is very important that individuals avoid spreading the flu to others.

Most students should be able to complete a successful semester despite a flu-induced absence. Faculty will provide students who are absent because of illness with a reasonable opportunity to make up missed work. Ordinarily, it is inappropriate to substitute for the missed assignment the weighting of a semester's work that does not include the missed assignment or exam. Completion of all assignments and exams assures the greatest chance for students to develop heightened understanding and content mastery that is unavailable through the weighting process. The opportunity to complete all assignments and exams supports the university's desire to enable students to make responsible situational decisions, including the decision to avoid spreading a contagious virus to other students, staff, and faculty, without endangering their academic work.

Students with the flu do not need to provide a physician's certification of illness. However, ill students should inform their teachers (but not through personal contact in which there is a risk of exposing others to the virus) as soon as possible that they are absent because of the flu. Likewise students should contact their instructors as quickly as possible to arrange to make up missed assignments or exams.

COURSE SCHEDULE (subject to change, if topics require more lecture time)

Lec. #	Week/Date	Topic	Reading	Assignments
1	1M – Aug. 24	Course Introduction		
2	1W – Aug. 26	Review of Fluid Mechanics	Ch.1	
3	1F – Aug. 28	Specific Energy	Ch. 2.1-4	
4	2M – Aug. 31	Specific Energy	Ch. 2.5-8	
5	2W – Sept. 2	Specific Energy		
6	2F – Sept. 4	Momentum	Ch. 3.1-3	HW #1 Due
7	3M – Sept. 7	No Class – Labor day		
8	3W – Sept. 9	Momentum	Ch. 3.4-6	
9	3F – Sept.11	Catch up		HW #2 Due
10	4M – Sept. 14	Uniform Flow	Ch. 4.1-4	
11	4W – Sept. 16	Uniform Flow	Ch. 4.5-8	
12	4F – Sept. 18	Uniform Flow	Ch. 4.9-12	HW #3 Due
13	5M – Sept. 21	Uniform Flow	Ch. 4.13-17	
14	5W – Sept. 23	Catch up		
15	5F – Sept. 25	GVF	Ch. 5.1-3	HW #4 Due
16	6M – Sept. 28	GVF	Ch.5.4-6	
17	6W – Sept. 30	Review for Exam 1		
18	6F – Oct. 2	Exam 1		
19	7M – Oct. 5	GVF	Ch. 5.7-9	
20	7W – Oct. 7	GVF	Ch. 5.10-11	
21	7F – Oct. 9	Catch up		HW #5 Due
22	8M – Oct. 12	Hydraulic Structures - gauging		
23	8W – Oct. 14	Hydraulic Structures - spillways	Ch. 6.1-4	
24	8F – Oct. 16	Hydraulic Structures - culverts	Ch. 6.5	HW #6 Due
25	9M – Oct. 19	Hydraulic Structures - culverts		
26	9W – Oct. 21	Hydraulic Structures - bridges	Ch. 6.6	
27	9F – Oct. 23	Hydraulic Structures - bridges		HW #7 Due
28	10M – Oct. 26	Catch up		
29	10W – Oct. 28	Unsteady Flow	Ch. 7.1-2	
30	10F – Oct. 30	Unsteady Flow	Ch.8.1	HW #8 Due
31	11M – Nov. 2	Unsteady Flow	Handouts	
32	11W – Nov. 4	Review for Exam 2		
33	11F – Nov. 6	Exam 2		
34	12M – Nov. 9	Catch up		
35	12W – Nov. 11	Introduction to HEC-RAS	manuals	
36	12F – Nov. 13	HEC-RAS workshop		
37	13M – Nov. 16	HEC-RAS workshop		
38	13W – Nov. 18	HEC-RAS workshop		
39	13F – Nov. 20	HEC-RAS workshop		
40	14M – Nov. 23	No Class – Thanksgiving Break		
41	14W – Nov. 25	No Class – Thanksgiving Break		
42	14F – Nov. 27	No Class – Thanksgiving Break		
43	15M – Nov. 30	No Class – HEC-RAS assignment		
44	15W – Dec. 2	Final project - assigned		
45	15F – Dec. 4	Work on final project		
46	16M – Dec. 7	Work on final project		
47	16W – Dec. 9	Work on final project		
48	16F – Dec. 11	Work on final project		