

# CE 4512: Open Channel Hydraulics (4 credits)

Fall 2017

University of Minnesota  
Department of Civil Engineering

## Instructor:

Michele Guala associate professor at CEGE and faculty at St. Anthony Falls Laboratory.

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## Office Hours:

Michele Guala

Mon and Wed 9:00 am - 10:00 pm 11:50-12:30 CEGE 161

Mon, Tue, Thus afternoon 2pm -5pm at SAFL [www.safl.umn.edu](http://www.safl.umn.edu) (382), pending email notification. Communication via email is preferred. Please do not leave messages on the phone.

**Prerequisites:** "C-" grade or better in CE 3502

## Class Lectures:

Mon and Wed 10:10 am – 11:50 am Civ E 205

## Text Book:

(suggested) Open Channel Hydraulics, T. W. Sturm, any edition

Another good book is the Open-Channel Hydraulics: Ven Te Chow. It is more complete but a little dated.

## Class Objectives:

The Department of Civil Engineering offers two ABET accredited undergraduate degrees: Civil, Environmental and Geo- Engineering (CEGE) and Geological Engineering (GeoE). The Department of Civil Engineering must demonstrate that all of their graduates have certain general skills and abilities. In this course, the following ABET Outcomes will be assessed:

- (a) an ability to apply knowledge of mathematics, science, and engineering.
- (c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- (e) an ability to identify, formulate, and solve engineering problems.
- (f) an understanding of professional and ethical responsibility
- (g) an ability to communicate effectively
- (j) a knowledge of contemporary issues
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**The course objectives are:**

- Apply conservation of mass, momentum and energy principles to open channel flow problems,
- Design channels and hydraulic structures using the concepts of uniform flow and gradually varied flow conditions,
- Introduce the principles of sediment transport and erodible beds in channels problems.

**Grading Policy:**

The final grade will result from the following:

Homework (graded)	20%
Projects (graded)	25%
Midterm Exam	25%
Final	<u>30%</u>
	100%

- A Represents achievement that is outstanding relative to the level necessary to meet course requirements.
- B Represents achievement that is significantly above the level necessary to meet course requirements.
- C Represents achievement that meets the course requirements in every respect.
- D Represents achievement that is worthy of credit even though it fails to meet fully the course requirements.
- F Represents failure
- I Assigned at the discretion of the instructor when, due to extraordinary circumstances, the student was prevented from completing the work of the course on time.

**Exams:**

The first exam will be on the first half of the program. The final exam will be comprehensive (full program).

Midterm exam: 30 October (to be confirmed)

Final exam:

**Mon, Dec 11, from 10:10 to 11:50 in class**

**Extra credit:** Up to 3 possible points to improve your final exam score (the maximum score is 30/30). The extra credits will be earned by making a brief power point presentation in front of the class of a topic of hydraulic interest you have documented and interpreted using knowledge from the class. Typical examples are hydraulic structures in rivers, possible failures of hydraulic components, sediments, bedforms. Bring a camera with you !

**Homework:**

You will be required to work individually on the assigned homework problems. I will collect them at the beginning of the class on the due date. All homework problems should be submitted as a stapled paper document, following standard engineering format for each of the problems (i.e. state known and unknowns, show all of your work, include relevant sketches and attach computer output (when needed), highlight final answers, name on each page). Illegible work will receive 0 points. Late assignments will not be accepted unless permission is given by the instructor in advance.

**Specific Format to be followed for Assignments:**

The following format must be followed when preparing CEGE 4512 assignments for submission. Professional engineering calculations are often reviewed by other professional engineers, so the

ability to communicate effectively is critical. Points will be deducted for repeated noncompliance.

1. Include separate title page with name, class, HW # and date.
2. Specify the units in your answer
3. For each problem give a brief problem statement and sketch of the problem.
4. Show your work. Answers are meaningless if they cannot be verified.
5. Describe what you are doing with short statements that correspond to the calculations—this will help you later when you review your work, and it allows someone else to follow your “train-of-thought.” Be sure to include any assumptions you had to make.
6. Begin each problem on a new page
7. Be neat, write legibly.
8. Use a straight edge for drawings.
9. Staple your pages together.
10. Present your final results in tabular form.

### **Projects:**

You will be required to work individually on two computational projects. You are free to choose the programming language.

### **Class Participation:**

Students are expected to participate in class discussions and small group activities. I will be asking questions throughout the lectures and expect students to try answering them to the best of their ability.

### **Collaboration on Assignments:**

Collaboration on the **concepts** covered in the homework assignments is encouraged; however, ***the assignment that you submit must be your own original work!*** You may ask questions of each other, and discuss general procedures and strategies about how to approach a problem, but the step-by-step calculations, spreadsheets, figures, conclusions, etc. must be your own work. To do otherwise is plagiarism, which is grounds for earning an "F" in the course, and possible expulsion from the University of Minnesota. All instances of scholastic dishonesty are required to be reported to the UofMN Office for Student Conduct & Academic Integrity.

### **Scholastic Dishonesty:**

You are expected to do your own academic work and cite sources as necessary. Failing to do so is scholastic dishonesty. Scholastic dishonesty means plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering, forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis. (Student Conduct Code: [http://www1.umn.edu/regents/policies/academic/Student\\_Conduct\\_Code.html](http://www1.umn.edu/regents/policies/academic/Student_Conduct_Code.html)) If it is determined that a student has cheated, he or she may be given an "F" or an "N" for the course, and may face additional sanctions from the University.

The Office for Student Conduct and Academic Integrity has compiled a useful list of Frequently Asked Questions pertaining to scholastic dishonesty: <http://www1.umn.edu/oscai/integrity/student/index.html>. If you have additional questions, please clarify with your instructor for the course. Your instructor can respond to your specific questions regarding what would constitute scholastic dishonesty in the context of

a particular class-e.g., whether collaboration on assignments is permitted, requirements and methods for citing sources, if electronic aids are permitted or prohibited during an exam.

### **Student Conduct Code**

The University seeks an environment that promotes academic achievement and integrity, that is protective of free inquiry, and that serves the educational mission of the University. Similarly, the University seeks a community that is free from violence, threats, and intimidation; that is respectful of the rights, opportunities, and welfare of students, faculty, staff, and guests of the University; and that does not threaten the physical or mental health or safety of members of the University community.

As a student at the University you are expected adhere to Board of Regents Policy: *Student Conduct Code*. To review the Student Conduct Code, please see:

[http://regents.umn.edu/sites/regents.umn.edu/files/policies/Student\\_Conduct\\_Code.pdf](http://regents.umn.edu/sites/regents.umn.edu/files/policies/Student_Conduct_Code.pdf).

Note that the conduct code specifically addresses disruptive classroom conduct, which means "engaging in behavior that substantially or repeatedly interrupts either the instructor's ability to teach or student learning. The classroom extends to any setting where a student is engaged in work toward academic credit or satisfaction of program-based requirements or related activities."

### **Use of Personal Electronic Devices in the Classroom**

Using personal electronic devices in the classroom setting can hinder instruction and learning, not only for the student using the device but also for other students in the class. To this end, the University establishes the right of each faculty member to determine if and how personal electronic devices are allowed to be used in the classroom. For complete information, please reference: <http://policy.umn.edu/education/studentresp>.

### **Makeup Work for Legitimate Absences**

Students will not be penalized for absence during the semester due to unavoidable or legitimate circumstances. Such circumstances include verified illness, participation in intercollegiate athletic events, subpoenas, jury duty, military service, bereavement including related travel, religious observances, participation in formal University system governance. Such circumstances do not include voting in local, state, or national elections. For complete information, please see: <http://policy.umn.edu/education/makeupwork>.

### **Discrimination, Sexual Harassment, and Assault**

I care about each of these problems and the negative impact they have on our community. You are welcome to speak with me about any of these issues, and I can help you connect with campus and community resources. Please be aware that in some instances I cannot keep these conversations confidential and may be required to report some of what I hear to university officials and/or to police. Within the requirements of my job, I will be as responsive to your requests for confidentiality as possible. To learn about Title IX complaints, visit [oscai.umn.edu/title-ix-process](http://oscai.umn.edu/title-ix-process).

### **Disability service available at UMN**

If you need professional help to remove any barrier preventing you to learn the class material and perform exams and tests, please visit the Disability Resource Center <https://diversity.umn.edu/disability/home>

Any changes in this syllabus will be communicated to you during class hours.

		<b>CE 4512</b>	<b>Open channel Hydraulics</b>		
Week			Special dates	Topics	Homework due dates (To be confirmed)
1	Wed	6-Sep		Introduction	
	Mon	11-Sep		Specific energy equation	
2	Wed	13-Sep			
	Mon	18-Sep		Critical depth	
3	Wed	20-Sep			Homework 1
	Mon	25-Sep		Momentum equation	
4	Wed	27-Sep			
	Mon	2-Oct		Surges and transitions	Homework 2
5	Wed	4-Oct			
	Mon	9-Oct		Uniform flow	
6	Wed	11-Oct			Homework 3
	Mon	16-Oct		Canal design	
7	Wed	18-Oct			
	Mon	23-Oct			Homework 4
8	Wed	25-Oct		Review	
	Mon	30-Oct	Midterm Exam		
9	Wed	1- Nov		Gradually varying flow	
	Mon	6- Nov			
10	Wed	8-Nov		Water surface profile	
	Mon	13-Nov		Spatially varied flow	
11	Wed	15-Nov		Culvert & bridges	Project 1 due
	Mon	20-Nov	19-21APS	HEC-RAS class	
12	Wed	22-Nov			Homework 5
	Mon	27-Nov		Sediment transport	
13	Wed	29-Nov		River morphodynamics	
	Mon	4-Dec			Homework 6
14	Wed	6-Dec		Review	
	Mon				
	Mon	11-Dec	Final Exam		
15		12-15	AGU		
	Wed	13-Dec	Last day of instruction		
		15-17 Dec			Project 2 due