

**CE 3502 Fluid Mechanics  
Spring 2020**

**Lecture: 11:15am-12:30pm** Tue and Thu, CEGE 210

**Laboratories as scheduled:** Mon 9:00 am-11:00am (277A) Wedn 2:30 pm-4:30 pm (277A)

**Mid Term #1:** March 3 **Mid term #2:** Apr 14 (in class)

**FINAL EXAM (as scheduled by the U):** 1:30 a.m.-3:30 a.m May 12 2020 (in class)

CEGE 3502 Fluid Mechanics (4.0 cr) Prereq-[AEM 2012 or AEM 3031], Math 2373, [IT or ForP major]. Program: Fluid statics/dynamics; kinematics of fluid flow; equations of motion; pressure-velocity relationships; viscous effects; boundary layers; momentum / energy equations; lift/drag; flow in pipes and pipe systems; hydraulic machinery; fluid measurements.

**Credits and Workload Expectations**

For undergraduate courses, one credit is defined as equivalent to an average of three hours of learning effort per week (over a full semester) necessary for an average student to achieve an average grade in the course. For example, a student taking a four credit course that meets for five hours a week, should expect to spend an additional seven hours a week on coursework outside the classroom.

**Instructor:**

Michele Guala, CEGE 161 Phone (612) 626-7843 & SAFL 382, Phone 612-625-9108

e-mail [mguala@umn.edu](mailto:mguala@umn.edu)

Office Hours CEGE : **Tue 9:30-10:30; Thu 9:30-10:30 & 1:30-2:30pm** and open door policy at SAFL ([www.safll.umn.edu](http://www.safll.umn.edu))

Students are welcome to contact Dr Guala via email to setup meetings even if they are outside office hours

**Graduate Teaching Assistants**

*Laboratory Instructors and Graders:*

Amirreza Ghasemi (email: [gghase018@umn.edu](mailto:gghase018@umn.edu)) Labs and HW grading

Jiyong Lee (email: [lee02291@umn.edu](mailto:lee02291@umn.edu)) Labs and HW grading

Office Hours CEGE 277: Tue 10-11am 277A & Wed 1:30-2:30pm

**Laboratory Schedule**

\* Section 3: Mon 9:00 am-11:00am (277A) Amirreza Ghasemi , Jiyong Lee

\* Section 5: Wedn 2:30 pm-4:30 pm (277A) Amirreza Ghasemi , Jiyong Lee

**Text (required):** Crowe, (LeBret), Elger, and Roberson, Engineering Fluid Mechanics, 9<sup>th</sup> -- 12<sup>th</sup> ed, (John Wiley & Sons, New York). There is an electronic version available (for a considerably reduced price) from the publisher. Old editions 9<sup>th</sup> and beyond are acceptable.

**Lab Manual (required):** CEGE 3502 Fluid Mechanics Lab Manual Spring 2016 – Available in the class web page for download at no cost → [http://personal.cege.umn.edu/~guala/webpage\\_CE3502\\_mic/index.html](http://personal.cege.umn.edu/~guala/webpage_CE3502_mic/index.html).

**Grading**

**Homeworks:** 6 problem sets will be graded. Assignments are due in your lab section drop box on the dates noted on the calendar below or as specified on the homework . **No credits for late homework , unless Dr Guala is notified in advance or a medical conditions is officially reported**

**Laboratories:** Nine lab sessions will be conducted in 277 CivE. Lab reports are due in your lab section drop box **one week after each lab by 5:30 pm. Laboratory attendance is required; i.e., without attending every lab, you will not pass the class. Please contact prof. Guala if there are specific problems or personal disabilities preventing your presence in the laboratory or class.** Your TA will take attendance and inform Prof. Guala of absences / tardiness. If you have a very good reason to miss or be late for a lab, contact Prof. Guala AND your TA before you miss it. At the latest (e.g., in the case of sudden illness) contact Prof. Guala and the TA within 24 hours of your laboratory. Otherwise, it may not be possible to make up the laboratory. **No credits for late lab reports, unless Dr Guala is notified in advance or a medical conditions is officially reported**

**A necessary ( but not sufficient ) condition to pass the course is to obtain an average score of at least 50% in the homeworks and in the lab reports.**

**Mid-term Tests:** There will be two mid-term tests. **March 3 and April 14 (in class, usual time)**

**Final Exam:** 1:30-3:30pm , **May 12(in class) Comprehensive on the full program**

**Both midterms and exams will be close books: however 1-2 pages of formulas are allowed. No smart phones or computers are allowed during exams.**

**Final grades** are given on an A – F basis with following weighting:

Final Exam	30%
Mid-term Tests	30% (2x15%)
Lab Grade	25%
Homework	15%
Total	100%

**Grading Criteria**

Grade	Lower-bound	Grade	Lower-bound	Grade	Lower-bound	Grade	Lower-bound
		B+	87	C+	77	D+	67
A	93	B	83	C	73	D	63
A-	90	B-	80	C-	70	D-	60

**University Grading Standards** will be followed in assigning grades for this course

- A achievement that is outstanding relative to the level necessary to meet course requirements.
- B achievement that is significantly above the level necessary to meet course requirements.
- C achievement that meets the course requirements in every respect.
- D achievement that is worthy of credit even though it fails to meet fully the course requirements.
- F represents failure (or no credit) and signifies that the work was either
  - (1) completed but at a level of achievement that is not worthy of credit or
  - (2) was not completed and there was no agreement between the instructor and the student that the student would be awarded an I.
- I (Incomplete) Assigned at the discretion of the instructor when, due to extraordinary circumstances, a student is prevented from completing the work of the course on time; this requires a written agreement between instructor and student.

**ABET Outcomes assessed:**

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

**Class Conduct** Sleeping, eating, or talking in class is not allowed. Please make sure cell phones are off and use care if arriving late or leaving early. The U's policy on Classroom Expectations Guidelines will be enforced. Students who disrupt the educational process (e.g. talking with friends) will need to leave the classroom.

**Academic Dishonesty** Academic dishonesty in any portion of the academic work for a course shall be grounds for awarding a grade of F or N for the entire course. The academic code of conduct can be found at [http://www1.umn.edu/regents/policies/academic/Student\\_Conduct\\_Code.pdf](http://www1.umn.edu/regents/policies/academic/Student_Conduct_Code.pdf)

**Disability (confidential)** Please contact the **Disability Services Testing Center** Suite 180 McNamara Alumni Center 200 Oak Street S.E. Minneapolis, MN 55455-2002 Phone: 612-624-1666 Fax: 612-626-9654 [dstest@umn.edu](mailto:dstest@umn.edu)

**Course Outline. (Could be subject to small modifications—check the web)**

Any updates on Labs , Homework and syllabus will be posted throughout the semester on the course web page, see: [http://personal.ce.umn.edu/~guala/webpage\\_CE3502\\_mic/index.html](http://personal.ce.umn.edu/~guala/webpage_CE3502_mic/index.html)

#	Date	Material Covered	Readings Chapter: Pages		Homeworks due date (to be confirmed)		Lab
			10 <sup>th</sup> ed	9 <sup>th</sup> ed			
1 2	1-21 1-23	Introduction Fluid Properties	1: all	1: all			NO
3 4	1-28 1-30	Fluid Statics	2: all	2: all			1a
5 6	2-4 2-6	Fluid Statics (cont) Nature of Flow deformation	3: 60-92	3: 33-56	Hom 1: 2-1		1b
7 8	2-11 2-13	Euler Equation Acceleration	4: 112-127	4: 77-91			2
9 10	2-18 2-20	Bernoulli Equation Rotation and Vorticity	4: 127-146	4: 92-114			3
11 12	2-25 2-27	Continuity Review	5: 170-194	5:127-138 5:138-150	Hom 2: 2-20		No
13 EX.	<b>3-3</b>	<b>Midterm TEST #1</b>					No
14	3-5	Momentum1	6: 208-236	6:163-179			No

Spring break Mar 9-13							
15 16	3-17 3-19	Momentum 2 Energy	7: 252-277	7: 217-237	Hom 3: 3-8		4
16 17	3-24 3-26	Energy		7: 229-232			5
17 18	3-31 4-2	Energy grade line	7: 252-277	7: 217-237 7: 229-232	Hom 4: 3-29		6
19 20	4-7 4-9	Dim Analysis Boundary Layer & Review	8: 292-315 9: 324-359 10: 359-371	8: 259-273 9: 281-307 10: 315-336			No
21 EX.	<b>4-14</b> 4-16	<b>Midterm TEST #2</b> Flow in Conduits					NO
22 23	4-21 4-23	Flow in Conduits 2 Drag and Lift	10: 371-391	10: 336-350	Hom 5: 4-19		7
24 25	4-28 4-30	Turbo-machinery Review	11: 407-435	11: 363-393	Hom 6 : 4-26		9

### Laboratory schedule

Jan 28-30: Feb 4-6      LAB 1: Fluid Properties (2 labs: 1a & 1b)  
 feb 11-13:              LAB 2: Pressure and Velocity Measurement  
 feb 18-20:              LAB 3: Application of Bernoulli Equation  
 mar 17-19:              LAB 4: Application of Momentum Theorem  
 mar 24-26:              LAB 5: Turbulence and Boundary Layer Demonstration  
 mar 31 – apr 2 :              LAB 6: Measurement of Pipe Friction  
 apr 21-23              :      LAB 7: Head Losses in Fixtures (local losses)  
 apr -----:              LAB 8: No  
 apr 28-apr 30:            LAB 9: Pump Demonstration + Pump Sizing Calculation