

## **CE 3305 – Fluid Mechanics Course Syllabus**

### **Time and Location**

Time is listed on attached schedule below. Location is TBA. The syllabus is adjusted to reflect special circumstances related to the international experience. The tabular schedule is a guideline; we will try to follow it closely, but be prepared to adjust to changes in pace dictated by our collective experience.

### **Instructor**

Theodore G. Cleveland, Ph.D., P.E., M. ASCE, F. EWRI  
Civil Engineering 203F (Texas Tech Office)  
Office Location TBA  
Cell Phone: 001-832-722-4185 (The 001 is USA Country Code)  
Email: ted.cleveland@gmail.com  
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### **Office Hours**

Open door – we can meet after each day for questions; also in mornings before/during breakfast

### **Catalog Description and Prerequisites**

CE 3305: Mechanics of Fluids (3:3:0). Prerequisite: CE2301. Hydrostatics; dynamics of viscous and nonviscous fluids; resistance to flow; flow in pipes and open channels.

## Textbook

DF Elger, BC Williams, Crowe, CT and JA Roberson, Engineering Fluid Mechanics 10th edition, John Wiley & Sons, Inc., 2013.

## Purpose

The course provides engineering students with fundamentals of fluid mechanics. Students should be able to use this foundation for the more in-depth courses to follow. This course provides students with a set of tools and concepts that are directly applicable to pipe systems, open channels, pumping plants, and measurement of fluid flows as well as other related problems that may be encountered as practicing engineers.

## Objectives

Upon completion of this course, students should be able to:

1. Apply fluid properties to analyze and solve fluid mechanics problems.
2. Apply conservation laws to analyze problems in hydrodynamics.
3. Apply systems and control volume methods based on conservation principles.
4. Estimate forces on objects immersed in stationary and moving fluids.
5. Analyze pipe flow (pressurized) in steady flow.
6. Apply principles of dimensional homogeneity.
7. Size machinery to generate required flows and pressure.
8. Analyze open conduits in steady flow.

The schedule for the course follows; the tabular schedule is intended to follow the graphic schedule on the following page. This course is coded at T1 in the graphical schedule.

## Course Schedule

Table 1: CE 3305 Course Schedule – Summer 2015

[ID: Lecture code; each  $\approx$  1.5 hours in duration;  
 DATE & TIME: Date and time of scheduled lecture;  
 TOPIC: Lecture content synopsis;  
 READING: Relevant Textbook Chapters.

ID	DATE & TIME	TOPIC	READING
1	14JUL15 (08:30-10:00)	Introduction; Team Building	Ch. 1
2	15JUL15 (08:30-10:00)	Intensive and Extensive Fluid Properties	Ch. 2
3	16JUL15 (08:30-10:00)	Fluid Statics, Pressure, Force	Ch. 3
4	16JUL15 (10:15-11:45)	Fluid Statics, Pressure, Force	Ch. 3
4.1	16JUL15 (11:45-12:15)	<b>Quiz 1</b>	
5	17JUL15 (08:30-10:00)	Bouyancy, Stability, Manometry	Ch. 3
6	17JUL15 (10:15-11:45)	Euler Equation	Ch. 4
7	21JUL15 (11:45-13:45)	Bernoulli Equation	Ch. 4
8	21JUL15 (13:45-15:45)	Reynold's Transport Theorem – Mass	Ch. 5
8.1	21JUL15 (15:45-16:15)	<b>Quiz 2</b> (Note afternoon time)	
9	22JUL15 (08:30-10:00)	Reynold's Transport Theorem – Momentum	Ch. 6
10	22JUL15 (10:15-11:45)	Reynold's Transport Theorem – Energy	Ch. 7
11	22JUL15 (11:45-12:15)	Dimensional Analysis and Similitude	Ch. 8
12	23JUL15 (08:30-10:00)	Flow in Closed Conduits	Ch. 10
13	23JUL15 (10:15-11:45)	Moody Diagram, Fitting Losses	Ch. 10
13.1	23JUL15 (11:45-12:15)	<b>Quiz 3</b>	
14	28JUL15 (10:15-12:15)	Fitting (Minor) Losses, Drag Reducing Agents	Ch. 10
15	31JUL15 (08:30-10:00)	Fluid Machinery; Pumps, Turbines, Compressors	Ch. 14
16	3AUG15 (08:30-10:00)	Flow in Open Conduits, Specific Energy	Ch. 15
17	4AUG15 (08:30-09:30)	Rapidly Varied Flow, Hydraulic Jump	Ch. 15
17.1	4AUG15 (09:30-10:00)	<b>Quiz 4</b>	
18	5AUG15 (08:30-10:00)	Gradually Varied Flow	Ch. 15
19	6AUG15 (08:30-10:00)	Computing Water Surface Profiles	Ch. 15
20	7AUG15 (12:45-14:15)	Boundary Layers – Laminar and Turbulent	Ch. 9
21	10AUG15 (08:30-09:30)	Boundary Layers – Flow over Flat Plate	Ch. 9
21.1	10AUG15 (09:30-10:00)	<b>Quiz 5</b>	
22	11AUG15 (08:30-10:15)	Form Drag – Flow around cylinder	Ch. 11
23	13AUG15 (08:30-11:45)	Fluid Forces on Bridge Pier	Ch. 15
24	13AUG15 (14:45-16:15)	<b>Final Examination</b> (Note afternoon time)	

6th American-German summer course Program July 13th - August 14th 2015 (June 26th, 2015 Lübben/Thiele)									
		class 1	class 2	lunchtime		class 3	class 4		
		8:30-10:00	10:15-11:45	30 min.	30 min.	12:45-14:15	14:45-16:15		
KW29	So	12-Jul	<b>Texas Tech students latest arrival in Wilhelmshaven</b>						
	Mo	13-Jul	Starting 10:00am Orientation Day						
	Tue	14-Jul	T1	IEP1	lunch		T2	T2	
	We	15-Jul	T1	IEP1	lunch		T2	T2	
	Thu	16-Jul	T1	T1	T1ex	lunch	T2	T2	
	Fr	17-Jul	T1	T1	lunch	IEP1	12: 15 - 13:45		
KW30	Sa	18-Jul	Weekend						
	Su	19-Jul							
	Mo	20-Jul	Field trip UNESCO World Heritage - National Parc Wadden Sea Scientific Spiekeroog island tripp (TTU students and Jade student assistants)						
	Tue	21-Jul	IEP1	IEP1	lunch	T1ex	T1	T1	
	We	22-Jul	T1	T1	T1ex	lunch	IEP1	IEP1	
	Thu	23-Jul	T1	T1	T1ex	lunch	IEP1	IEP1	
KW31	Fr	24-Jul	Political and intercultural field trip to BERLIN (TTU students and Jade student assistants)						
	Sa	25-Jul							
	Su	26-Jul							
	Mo	27-Jul							
	Tue	28-Jul	IEP1	T1	T1ex	lunch	T2	T2	
	We	29-Jul	final examination IEP part 1 (45minutes)	IEP2	lunch		T2	T2	
KW32	Thu	30-Jul	Mercedes Benz plant (TTU students and Jade student assistants)						
	Fr	31-Jul	T1	IEP2	IEP2ex	lunch			
	Sa	1-Aug	Weekend						
	Su	2-Aug							
	Mo	3-Aug	T1	IEP2	IEP2ex	lunch	T2	T2	
	Tue	4-Aug	T1	IEP2	IEP2ex	lunch	Wessel Hydraulik company 13:00 - 15:00 Group A and 15:00 - 17:00 Group B (TTU students and Jade student assistants)		
KW33	We	5-Aug	T1	IEP2	IEP2ex	lunch	T2	T2	
	Thu	6-Aug	T1	IEP2	IEP2ex	lunch	T2	T2	
	Fr	7-Aug	IEP2	IEP2	IEP2ex	lunch	T1		
	Sa	8-Aug	Learning Weekend Volleyball tournament - barbecue						
	Su	9-Aug							
	Mo	10-Aug	T1	IEP2	IEP2ex	lunch	T2	T2	
KW33	Tue	11-Aug	T1	IEP2	IEP2ex	lunch	T2	T2	
	We	12-Aug	IEP2	IEP2	lunch		final examination T2		
	Thu	13-Aug	T1	T1	lunch		final examination T1		
	Fr	14-Aug	IEP2	IEP2	lunch		final examination IEP part 2	farewell dinner	
	Sa	15-Aug	Departure						

**abbreviations:** T1 "Mechanics of Fluids" at TTU CE 3305

T2 "Rubber Technology" at TTU

IEP "International Engineering Project" at TTU ENGR 3301

# Assessment Instruments

## Homework

Homework will be due at the beginning of class on the second class day after it is assigned. You may work in teams and submit as a team assignment. Identify all team members. Homework problem solving approach:

1. State the problem and sketch the system
2. Identify the given information
3. Identify governing equations and state assumptions
4. List the unknowns
5. Solve for unknowns and calculate results
6. Discuss the results

## Quiz

Five (5) quizzes are scheduled.<sup>1</sup> These quizzes will be comprised of several problems, possibly verbatim from the homeworks, and conceptual questions derived from lecture and homework materials.

## Examinations

There will be one final examination, comprehensive, but similar to homework problems. The examination will be open-notes, open-book.

## Grading Policy

Final grades are determined based on performance during the course. Letter grades will be assigned using University standards. The **approximate** weighting of graded material in determining the final grade is as follows<sup>2</sup>:

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<sup>1</sup>The quizzes replace the usual mid-term exam.

<sup>2</sup>Graded materials with fewer than 100 points will have raw scores normalized to 100 points for calculating the final grade.

Item	Percent of Grade
Exercises	20%
Quizzes	30%
Examination	50%

## ABET Program Outcomes

A subset of the ABET Program Outcomes are addressed in CE 3305, these outcomes are listed below:<sup>3</sup>

- 3[a]. Ability to apply knowledge of mathematics, science, and engineering.
- 3[b]. Ability to design and conduct experiments, as well as to analyze and interpret data.
- 3[e]. Ability to identify, formulate, and solve engineering problems.
- 3[i]. Recognition of need for life-long learning.
- 3[k]. Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- 8[d]. Proficiency in water resources engineering.

## Academic Misconduct

Refer to the Texas Tech University Catalog and operating policies (OP 34.12) regarding academic integrity, cheating, and plagiarism. Academic dishonesty will not be tolerated.

## Disability Policy

*“Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructors office hours. Please note instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, you may contact the Student Disability Services office at 335 West Hall or 806- 742-2405.”*

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<sup>3</sup>Item 3[b] below is only partially fulfilled – in this course students will analyze and interpret data, design of experiments is beyond the scope of the class.