CE 3305 – Fluid Mechanics
Course Syllabus

Time and Location

Time is listed on attached schedule below.
Location is Jade Hochschule, Wilhelmshaven, GERMANY, Bldg. TBD, Room TBD.

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

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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:

Course Schedule

Table 1: CE 3305 Course Schedule – Summer 2018

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

ID	DATE	TOPIC	READING
	09 JUL 18	Orientation to Jade and Wilhelmshaven	
1	10 JUL 18	Introduction; Team Building	pp. 1-24
2	11 JUL 18	Intensive and Extensive Fluid Properties	pp. 28-54
3	12 JUL 18	Fluid Statics, Pressure, Forces on Submerged Objects	pp. 60-81
4	13 JUL 18	Bouyancy, Stability, Manometry	pp. 81-88
	14 JUL 18	Spiekeroog (Sea life in productive fishery; mudflat hike; touch the North Sea	
5	16 JUL 18	Euler Equation	pp. 88-94
6	17 JUL 18	Bernoulli Equation	pp. 111-132
7	18 JUL 18	Vorticity; Flow Measurement	pp. 132-153
8	19 JUL 18	Reynold's Transport Theorem – Mass	pp. 169-191
	20 JUL 18	Travel to Hamburg, Walking tour of Rathaus area	
	21 JUL 18	Hamburg: Miniatur Wunderland, Altoona, Reeperbahn	
	22 JUL 18	Maritime Museum, Travel to Wilhelmshaven	
9	23 JUL 18	Reynold's Transport Theorem – Momentum	pp. 209-237
10	24 JUL 18	Reynold's Transport Theorem – Energy	pp. 252-277
11	25 JUL 18	Dimensional Analysis and Similitude	pp. 292-316
12	26 JUL 18	Flow in Closed Conduits	pp. 359-371
13	27 JUL 18	Moody Diagram, Fitting Losses	pp. 359-371
	28 JUL 18	Free day	
	29 JUL 18	Free day	
14	30 JUL 18	Fluid Machinery; Pumps, Compressors and Turbines	pp. 517-549
15	01 AUG 18	Computational Hydraulics: Pipe Networks	
16	02 AUG 18	Flow in Open Conduits, Specific Energy	pp. 554-577
	03 AUG 18	Bremerhaven: Maritime Museum, Emigration Center	
	04 AUG 18	Free day	
	05 AUG 18	Free day	
14	06 AUG 18	Rapidly Varied Flow, Hydraulic Jump	pp. 577-582
15	07 AUG 18	Gradually Varied Flow	pp. 582-588
16	08 AUG 18	Computational Hydraulics: Water Surface Profiles	

Continued on next page

Table 1: CE3305 Schedule and Lecture Abstracts — Continued

ID	DATE	TOPIC	READING
17	09 AUG 18	Boundary Layers – Laminar and Turbulent	pp. 324-347
18	10 AUG 18	Boundary Layers – Flow over Flat Plate	pp. 333-350
	11 AUG 18	Free day	
	12 AUG 18	Free day	
19	13 AUG 18	Flow around Cylinder; Forces on a Bridge Pier	pp. 406-437; 567-582
20	14 AUG 18	**Final Examination**	Farewell BBQ
21	15 AUG 18	Wilhelmshaven to Berlin	
21	16 AUG 18	Reichstag Tour; Holocaust Memorial	
21	17 AUG 18	BMW Plant; German Museum Technology	
	18 AUG 18	Berlin Free Day; Farewell Dinner	
	19 AUG 18	Depart from Berlin to USA	

Assessment Instruments

Homework

Homework will be due at the beginning of class on the second class day after it is assigned. Homework problem solving approach:

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

Homework should be scanned, photographed, or otherwise produced digitally — bundled into a **single** file in `.PDF` format and e-mailed to me by the due date.[1] I will confirm receipt

[1] Do not send MS Word files – they get too big. Also be sure you send me the actual file, and not a link to some One-Drive or Google Docs location — I won't even attempt to find your document and you will earn a zero. What has worked for past study-abroad classes is for you to use your phone and photograph your work, then insert the photographs (big enough to read) into a Word file, then save/export the file as a PDF, and email the PDF. Paper management is a challenge, this reduces the amount of paper we both have to handle (and you can get by with just a spiral notebook.

and then electronically spot-check the homework. My solutions will be posted after the homework due date.

Quiz

Five (5) quizzes are anticipated.[2] 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[3]:

Item	Percent of Grade
Participation	20%
Exercise/Quiz	30%
Examination	50%

ABET Program Outcomes

A subset of the ABET Program Outcomes are addressed in CE 3305, these outcomes are listed below:[4]

[2] These quizzes replace the usual mid-term exam.

[3] Graded materials with fewer than 100 points will have raw scores normalized to 100 points for calculating the final grade.

[4] 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.

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."