CE 3305 – Fluid Mechanics
Course Syllabus

Time and Location

Meetings are listed in the schedule. The class will meet at Jade Hochschule, Westbaude (West Building), Room WE-11, Wilhelmshaven, GERMANY

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 2019

[ID: Lecture code; each ≈ 1.5 hours in duration;
DATE & TIME: Date and time of scheduled lecture;
TOPIC (READING) : Lecture content synopsis (Textbook Pages)
EXERCISES : Upload to `www.rtfmps.com/moodle`

ID	DATE	TOPIC (READING)	ASSESSMENT
	7 JUL 19	Arrive in Wilhelmshaven	
	8 JUL 19	Orientation to Jade and Wilhelmshaven	
1	9 JUL 19	Introduction; Computational Hydraulics (pp. 1-24)	
2	9 JUL 19	Intensive and Extensive Fluid Properties (pp. 28-54)	
3	10 JUL 19	Fluid Statics and Pressure (pp. 60-81)	Q1
4	10 JUL 19	Forces on Submerged Objects, Bouyancy (pp. 60-88)	
5	11 JUL 19	Euler Equation (pp. 88-94)	Q2
	12 JUL 19	Free Day	
	13 JUL 19	Free Day	
	14 JUL 19	Free Day	
6	15 JUL 19	Bernoulli Equation (pp. 111-132)	
7	16 JUL 19	Vorticity (pp. 132-153)	Q3; ES1
8	16 JUL 19	Reynold's Transport Theorem – Mass (pp. 169-191)	
9	17 JUL 19	RTT – Momentum (pp. 209-237)	Q4
	18 JUL 19	Free Day	
	19 JUL 19	Free Day	
	20 JUL 19	Free Day	
	21 JUL 19	Free Day	
10	22 JUL 19	RTT – Energy (pp. 252-277)	
11	23 JUL 19	Dimensional Analysis and Similitude (pp. 292-316)	Q5; ES2
12	23 JUL 19	Flow in Closed Conduits (pp. 359-371)	Q6
13	24 JUL 19	Moody Diagram, Fitting Losses (pp. 359-371)	
14	24 JUL 19	System and Pump Curves (pp. 385-388)	Q7
15	25 JUL 19	Computational Hydr. : Pipe Network (pp. 388-391)	
16	25 JUL 19	Unsteady Flow in Pipelines (Rigid Column Theory)	Q8
	26 JUL 19	Free day	
	27 JUL 19	Free day	
	28 JUL 19	Free day	
17	29 JUL 19	Unsteady Flow in Pipelines (Elastic Theory)	

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Table 1: CE3305 Schedule and Lecture Abstracts — Continued

ID	DATE	TOPIC (READING)	ASSESSMENT
18	29JUL 19	Flow in Open Conduits, Specific Energy (pp. 554-577)	Q9; ES3
19	30 JUL 19	Rapidly Varied Flow, Hydraulic Jump (pp. 577-582)	
20	30 JUL 19	Gradually Varied Flow (pp. 582-588)	Q10
21	31 JUL 19	Comp. Hydr. : Water Surface Profiles (pp. 584-590)	
22	31 JUL 19	Fluid Machinery (pp. 517-549)	Q11
23	1 AUG 19	Laminar and Turbulent Boundary Layers (pp. 324-347)	
24	1 AUG 19	BLT – Flow over Flat Plate (pp. 333-350)	Q12
	3 AUG 19	Free day	
	4 AUG 19	Free day	
	5 AUG 19	Free day	
25	5 AUG 19	BLT – Flow around Cylinder (pp. 406-437; 567-582)	Q13; ES4
26	6 AUG19	Comp. Hydr. : Inviscid Flow	Q14
27	7 AUG 19	Flow Measurement (pp. 132-153)	Q15; ES5
28	9 AUG 19	Final Examination	
	10 AUG 19	Free day	
	11 AUG 19	Free day	
	12 AUG 19	International Engineering Project Presentations; Farewell BBQ	
	13 AUG 19	Leave Wilhelmshaven to Berlin	
	14 AUG 19	Reichstag Tour; Holocaust Memorial	
	15 AUG 19	Cold War Bunker; German Museum Technology	
	16 AUG 19	Berlin Free Day; Farewell Dinner	
	17 AUG 19	Depart from Berlin to USA	

Assessment Instruments

Homework

Homework will be due at the beginning of class on the dates shown in the schedule. 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 uploaded to the server by the due date.[1] I will confirm receipt and then electronically spot-check the homework. My solutions will be posted after the homework due date. The server has a file size limit on the upload, so if too big, break the file into two parts.

Quiz

Quizzes are included as part of the grading scheme. The quizzes are administered by the MOODLE system. Be sure to complete them before you are locked out of the quiz.[2]

Examinations

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

[1] What has worked for past study-abroad classes is for you to use your phone and photograph your work, then bundle the images and export as a PDF, and upload 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.

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

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%
Homework	30%
Examination	50%

ABET Program Outcomes

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

- `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

[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.

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."