Introduction to Fluid Mechanics (FGEE024812)

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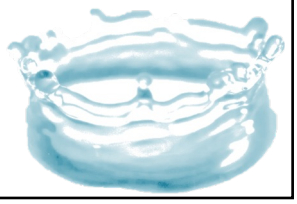

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Introducing Fluid Mechanics teaching team…

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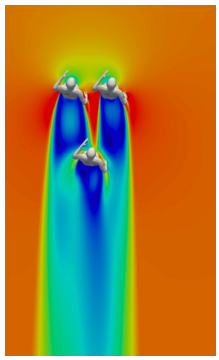
Prof. Dariusz WANATOWSKI

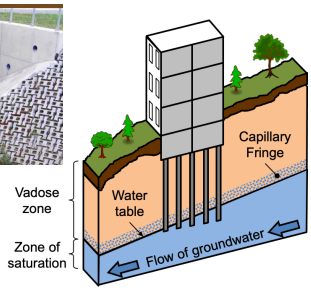


Education and Work Experience:

1999, MSc Highway Eng., Poznan University of Technology, Poland
2005, PhD Geotechnical Eng., NTU Singapore
2005-06, Post-doctoral Researcher, NTU Singapore
2006-13, University of Nottingham, UK
2007-08, ARUP, Nottingham (Geotechnical Consultant, part-time)
2013-16, University of Nottingham, Ningbo, China
2016-now, University of Leeds and SWJTU-Leeds Joint School

Expertise

- Advanced Soil Mechanics
- Geotechnical Engineering
- Ground Improvement
- Slope Stability



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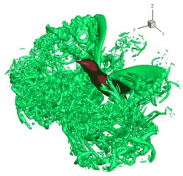
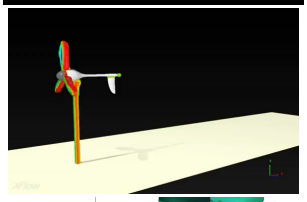
Dr. Jamie F. TOWNSEND



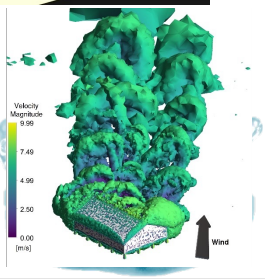


Education and Work Experience:

2015, BSc (Hons) Mathematics, Plymouth University, UK
2016, MSc Computational Fluid Dynamics, Cranfield University, UK
2019–20, Visiting Research Fellow, Nagoya University, Japan
2020, PhD Aerospace, Cranfield University, UK
2020–21, Postdoctoral Research Fellow, Cranfield University, UK
2021–now, Postdoctoral Researcher, Southwest Jiaotong University, China

Expertise

- Computational Fluid Dynamics
- Wind Engineering
- Wind Tunnel Testing
- Numerical Methods



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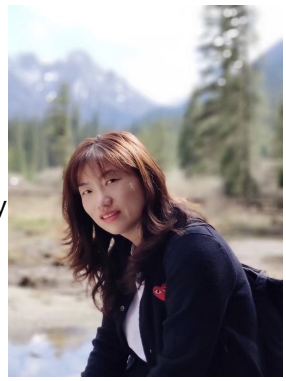
Dr. Chen Yu



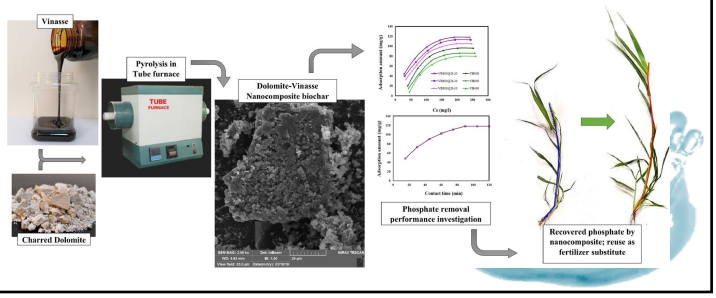
Education and Work Experience:

2002, Undergraduate degree of Civil Engineering, Southwest Jiaotong University
2005, Master's degree of Environmental Engineering, Southwest Jiaotong University
2015, Ph.D. for Municipal Engineering, Southwest Jiaotong University

Since 2005, Senior Engineer for Environmental Engineering
in the Faculty of Geosciences and Environmental Engineering
at the Southwest Jiaotong University

Expertise

Sewage treatment engineering design
Phosphorus removal and recovery
Heavy metal pollution control
Solid waste recycling application



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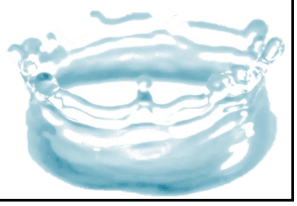
Overview

Class time: Monday 9:50–12:15 (Weeks 1-17, Final Exam in Week 18)

Classroom: X4247

Course description: This course is intended to introduce the fundamentals of fluid mechanics to undergraduate environmental engineering students.

Prerequisites: ENSC 2113 (Statics), MATH 2153 (Mathematics).



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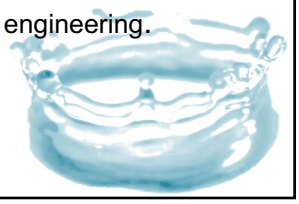
Course Objectives

- Introduce students to the fundamental theories and principles of fluid mechanics.
- Develop practical problem-solving skills in fluid mechanics including the use of: equations of state, hydrostatic equation, conservation of mass (continuity), conservation of energy, conservation of linear momentum, fluid friction equations for laminar flow, turbulent conduit flow and open channel flow, external flow lift and drag equations, pump performance curves, and isentropic flow applied to nozzles.
- Consolidate and enhance basic knowledge of mathematics, physics and mechanics, and cultivate the ability to analyze and solve practical problems in environmental engineering.



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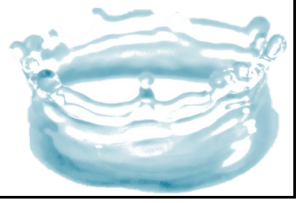
Learning Objectives

- Fluid Mechanics as a professional basic course for environmental engineering majors, is a bridge connecting early basic courses and subsequent professional courses.
- Through the study of this course, students will master the basic properties of fluids, the laws of fluid stillness and motion, the interaction between fluids and boundaries, open channel flow, pipe flow, weir flow, and have basic skills in fluid calculations (hydraulic calculations) for **solving relevant fluid mechanics problems in the environmental engineering major**.



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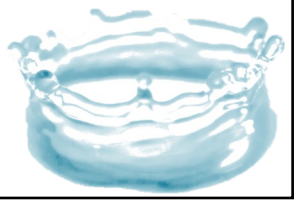
Learning Outcomes

Upon completion of this course students will

- Master fundamental theories and principles of fluid mechanics.
- Develop practical problem-solving skills in fluid mechanics.
- Consolidate and enhance their knowledge of mathematics, physics and fluid mechanics relevant to environmental engineering.



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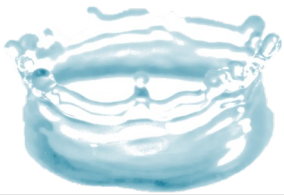
Why is this important to you?

Fluid mechanics is **ubiquitous in the field of environmental engineering** as the majority of environmental heat and pollutant transport processes are driven by fluid flows including dominant processes that control heat, mass, and pollutant transport in the environment.



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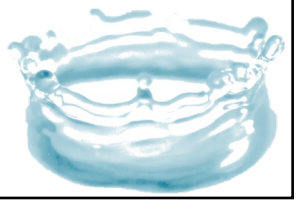
Why is this important to you?

A number of environmental, geotechnical and structural engineering problems are intimately linked to fluid mechanics. Examples include

- ❑ the synergy of fluid principles in air pollution control
- ❑ water and wastewater treatment
- ❑ groundwater management and control
- ❑ and the construction of dams and bridges



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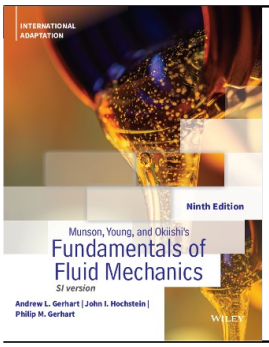
Required Textbook >>> YOU MUST HAVE IT !!!

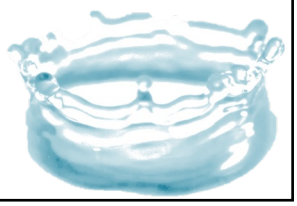


Fundamentals of Fluid Mechanics

Ninth Edition

Munson • Young • Okiishi

Philip M. Gerhart • Andrew I. Gerhart • John I. Hochstein



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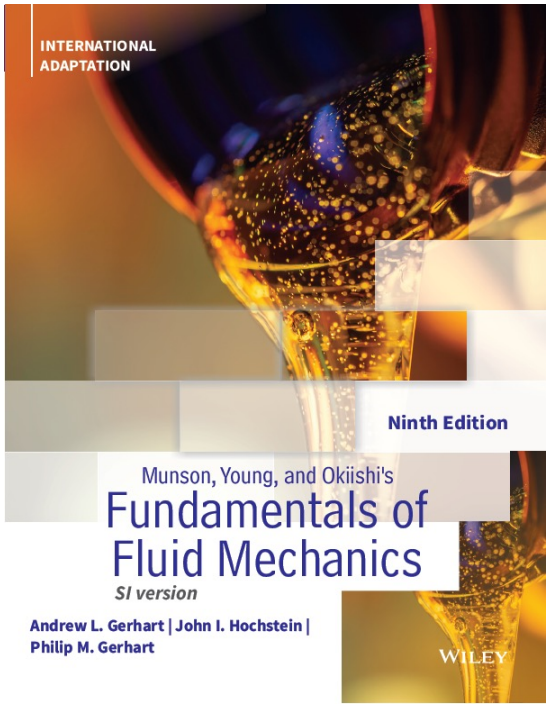

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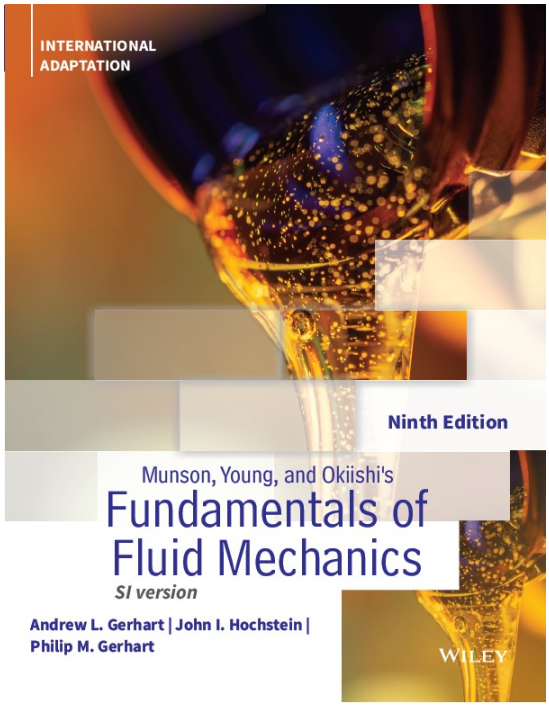

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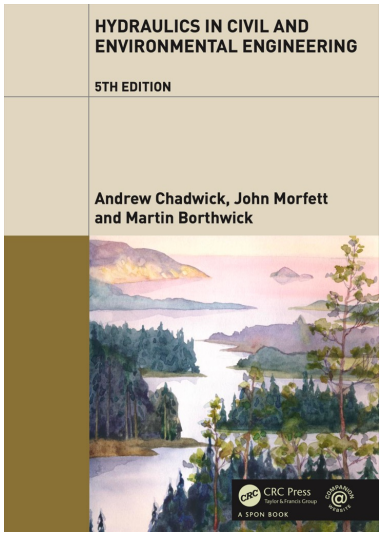
Recommended Textbook > YOU DON'T HAVE TO HAVE IT



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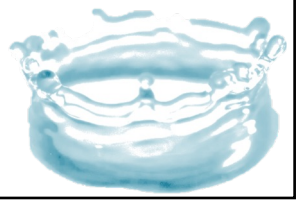

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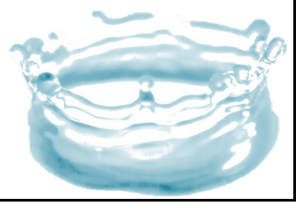
Tentative Teaching Calendar

Week	Date and time	Teaching Contents	Instructor	Teaching time		Notes
				Lecture	Practice	
1	26/2/24 (9:50-12:15)	Ch 1: Introduction	DW	3	0	-----
2	4/3/24 (9:50-12:15)	Ch 2: Fluid Statics (part 1)	JT	2	1	-----
3	11/3/24 (9:50-12:15)	Ch 2: Fluid Statics (part 2)	JT	2	1	-----
4	18/3/24 (9:50-12:15)	Ch 3: Elementary Fluid Dynamics – The Bernoulli Equation	DW	2	1	-----
5	25/3/24 (9:50-12:15)	Ch 4: Fluid Kinematics	DW	2	1	**Homework 1 (Ch: 1-4)**
6	1/4/24 (9:50-12:15)	Ch 5: Finite control Volume Analysis	JT	2	1	-----
7	8/4/24 (9:50-12:15)	Ch 6: Differential Analysis of Fluid Flow (part 1)	DW	2	1	-----



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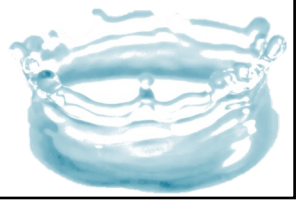
8	15/4/24 (9:50-12:15)	Ch 6: Differential Analysis of Fluid Flow (part 2)	DW	2	1	-----
9	22/4/24 (9:50-12:15)	Ch 7: Dimensional Analysis, Similtude, and Modeling (part 1)	DW	2	1	-----
10	29/4/24 (9:50-12:15)	Ch 7: Dimensional Analysis, Similtude, and Modeling (part 2)	DW	2	1	**Mid-term Exam (Ch 1-7)**
11	6/5/24 (9:50-12:15)	Ch 8: Viscous Flow in Pipes	JT	2	1	-----
12	13/5/24 (9:50-12:15)	Ch 9: Flow Over Immersed Bodies	DW	2	1	-----
13	20/5/24 (9:50-12:15)	Ch 10: Open-Channel Flow	JT	2	1	-----
14	27/5/24 (9:50-12:15)	Ch 11: Compressible Flow (part 1)	JT	2	1	**Homework 2 (Ch: 8-11)**
15	3/6/24 (9:50-12:15)	Ch 11: Compressible Flow (part 2)	JT	2	1	-----
16	**10/6/24**	**NO CLASS (Dragon Boat Festival)**				
17	17/6/24 (9:50-12:15)	Ch 12 Turbomachines	JT	2	1	-----
18	**24/6/24 (10:00-12:00)**	**Final exam** (details to be confirmed later)				

Note: For details of Chapters please refer to *Munson et al., 'Fundamentals of Fluid Mechanics', 8th Edition, Wiley & Sons.*

Attendance is **COMPULSORY**. It is necessary to be successful in this course. If you cannot attend any lectures due to illness or other reasons beyond your control, please inform the instructors and teaching assistant in advance.



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Assessment

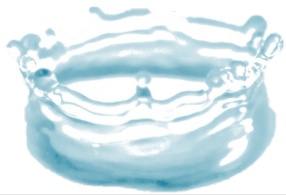
Grading Policy:

Homework 1	10% (week 5)
Mid-term Exam	25% (week 10)
Homework 2	10% (week 14)
Final Exam	55% (week 18)

Grade Scale:

A: 85 - 100%
B: 75 - 84%
C: 60 - 74%
F: 0 - 59%

Academic Misconduct: In this course, all the assignments including homework and exams should represent your individual effort, unless explicitly stated in the assignment. You may talk with other students and tutors about your assignments, but you should work through the computations individually and submit your own answers.



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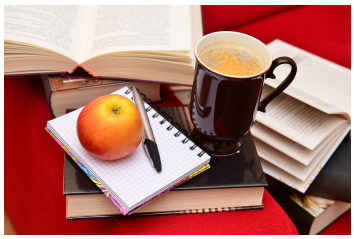
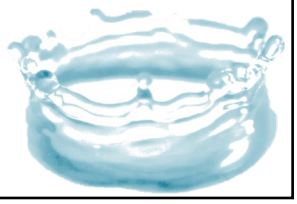
How to do well in the course?



- ❑ Come prepared to the class.
- ❑ Participate actively in the class.
- ❑ Get familiar with a new vocabulary, if necessary…
- ❑ Practice example problems from the textbook.
- ❑ Discuss your learning problems with teaching team. Please let us know your problem in advance.
- ❑ Solve homework problems yourself and do not worry too much about homework grades.
- ❑ Revise well before your exams.



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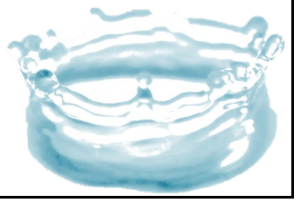
Questions



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