

Syllabus for the Intermediate Fluid Mechanics course

Course Information – Spring 2016

Class Section: MECH 4330.001.16S
Course Title: Intermediate Fluid Mechanics
Class Level: Undergraduate
Class Credits: 3 Credits
Room: ECSS 2.412
Time: Tuesday and Thursday 05:30 pm-06:45 pm
Starts: January 11, 2016
Ends: May 9, 2016

Professor Contact Information

Prof. Giacomo Valerio Iungo
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Office hours: Wednesday 2:30-4:00 pm, or by appointment requested via email

Course prerequisite: MECH 3315 (Fluid Mechanics)

Course Description:

In this course some fundamental equations governing the fluid motion are revised, such as the Navier-Stokes equations and the Prandtl's theory for boundary layer flows. In the first part of the course, flow over rigid bodies with different geometries is described, paying particular attention to the separation phenomenon and to bluff body aerodynamics. Some hints on road vehicle aerodynamics are also provided. The aerodynamics of lifting surfaces is addressed. In the last part of the course, basic concepts of compressible flows will be covered.

Student Learning Objectives/Outcomes

Once the student will have fulfilled her/his responsibility (e.g. attend classes, be attentive, study the assigned material, among others), the following goals will be achieved:

- In-depth understanding of the physics governing incompressible flows and capability to describe a large range of aerodynamic phenomena;
- Understanding the generation of lift and drag forces from rigid bodies with different geometries;
- Basic concepts on compressible flows.

This elective course is mainly focused on in depth understanding of several fluid mechanics phenomena, rather than applications or numerical exercises/homework assignments.

Suggested Textbooks and Materials

Lecture slides will be provided by the instructor. The suggested textbooks are the following:

- G. Buresti. Elements of Fluid Dynamics. Imperial College Press Fluid Mechanics, Volume 3, 2012, ISBN 13 978-1848168893
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- R.W. Fox & A.T. McDonald's. Introduction to Fluid Mechanics. 8th Edition, P.J. Pritchard, John Wiley, New York, 2009, ISBN 13 978-0470547557 (optional)
 - G.K. Batchelor. An Introduction to Fluid Dynamics. Cambridge Mathematical Library, 2000, ISBN 13 978-0521663960 (optional)
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Assignments & Academic Calendar

Week 1-2	Review of the Navier-Stokes equations
Week 3	Kelvin-Stokes theorem and D'Alambert's paradox
Week 4	Review of the Prandtl's theory for Boundary-Layer flows
Week 5	Flow over a flat plate; flow separation
Week 6-7	Bluff body aerodynamics; Review W1-W7
Week 8	Road vehicle aerodynamics
Week 9	Lift generation and the Kutta-Joukowski theorem
Week 10-11	Lifting-line theory
Week 12	Finite-wing aerodynamics; Review W8-W12
Week 13-14	Compressible flows
Week 15-16	Shock waves; Final

Grading Policy

Pop Quiz	10%
Midterm 1	25%
Midterm 2	25%
Final (Comprehensive)	40%

Policies and Procedures for Students

The University of Texas at Dallas provides a number of policies and procedures designed to provide students with a safe and supportive learning environment. Brief summaries of the policies and procedures are provided for you at

<http://provost.utdallas.edu/home/index.php/syllabus-policies-and-procedures-text> and include information about technical support, field trip policies, off-campus activities, student conduct and discipline, academic integrity, copyright infringement, email use, withdrawal from class, student grievance procedures, incomplete grades, access to Disability Services, and religious holydays. You may also seek further information at these websites:

- http://www.utdallas.edu/BusinessAffairs/Travel_Risk_Activities.htm
 - <http://www.utdallas.edu/judicialaffairs/UTDJudicialAffairs-HOPV.html>
 - <http://www.utsystem.edu/ogc/intellectualproperty/copypol2.htm>
 - <http://www.utdallas.edu/disability/documentation/index.html>
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