# *Syllabus for the Intermediate Fluid Mechanics course*

**Course Information – Fall 2015**

Class Section: MECH 4330.001.15F
Course Title: Intermediate Fluid Mechanics
Class Level: Undergraduate
Class Credits: 3 Credits
Room: ECSS 2.203
Time: Monday and Wednesday 10:00am-11:15am
Starts: August 24, 2015
Ends: December 17, 2015

**Professor Contact Information**

Prof. Giacomo Valerio Iungo
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Office hours: Wednesday 11:30-2:00 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

- 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 Dynamcs. Cambridge Mathematical Library, 2000, ISBN 13 978-0521663960 (optional)

**Assignments & Academic Calendar**

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| 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**

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| 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