



UNIVERSITY OF GENOA

PhD Program in Civil, Chemical and Environmental Engineering

Course offered for the PhD program in Civil, Chemical and Environmental Engineering A.Y. 2016/2017 (XXXII, XXXI and XXX cycles)

(possibility of participation for students in other PhD cycles or other PhD courses)

1. Title

Fluid-solid interactions

2. Course Description

The aim of the course is to give the students the ability to address the main issues of fluid-solid interactions, in a large variety of applications (civil, marine, aerospace, biomechanical, ...). The course is based on the on-line MOOC "Fundamentals of fluid-solid interactions" which the students will use as support.

Prerequisite

- Fundamentals of Fluid Mechanics and of Structural Dynamics
- Before the course, the student should register (free) on Coursera for the on-line course, and browse through all the course (about 6 hours of videos). Lectures will be based on the material of the Mooc, but a preliminary knowledge of the content is needed for a better benefit.

3. Course Organization

- **Day 1 (September 19th, 2017)**
 - **Lecture 1:** Fundamentals
 - **Tutorial 1:** Applied dimensional analysis in FSI
 - **Lecture 2:** Coupling with a still fluid
 - **Tutorial 2:** Added mass on a submerged cable. Sloshing in a truck
- **Day 2 (September 20th, 2017)**
 - **Lecture 3:** Coupling with a fast flow
 - **Tutorial 3:** Instability of a pump rotor. Panel flutter
 - **Lecture 4:** Coupling with any flow
 - **Tutorial 4:** Galloping of a square building. Energy harvesting by VIV

4. Teacher

[Emmanuel de Langre](#)

Professor, École Polytechnique, Palaiseau, France

Editor of the [Journal of Fluids and Structures](#)

5. Duration and credits

8 hours (3 credits)



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6. Activation mode and teaching period

The course will be held in two days, as specified above. The minimum number of participants to activate the course is 5.

7. Deadline for registration

The deadline for applications is September 1st, 2017; please, send an e-mail confirmation to Giuseppe Piccardo (giuseppe.piccardo@unige.it).

8. Final exam

Written examination (solution to simple problems; one hour at the end of second day).

9. Recommended References

"Fundamentals of fluid-solid interactions". Mooc on Courser, www.coursera.org/learn/fluid-solid-interaction

Païdoussis, M. P., Price, S. J., de Langre, E. (2010). Fluid-structure interactions: Cross-flow-induced instabilities. Cambridge University Press

Blevins, R. D. (1990). Flow-induced vibration. Van Nostrand Reinhold

Axisa, F. Antunes, J. (2006). Modelling of Mechanical Systems: Fluid-Structure Interaction (Vol. 3). Butterworth-Heinemann

Dowell, E. (2014). A modern course in aeroelasticity (Vol. 217). Springer.