SIMULATION MULTIPHYSIQUE EN CONCEPTION MÉCANIQUE

MULTIPHYSICS SIMULATION IN MECHANICAL DESIGN

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| Lecturers : 14.0 | TC : 0.0 | PW : 0.0 | Autonomy : 6.0 | Study : 12.0 | Project : 0.0 | Language : FR

Objectives

The objective of the course is to present the formulations and the discretization methods capable of simulating coupled problems. For this purpose, the integral and variational formulations, adapted to fluid and solid media, will be analyzed and put in complementarity. Digital implementations on concrete examples will be carried out within the framework of 3 BE. The fluid-structure coupling, with and without flow, will be particularly studied as well as the electromagnetic and electro-static coupling in the case of solid and fluid media (piezoelectics, ferro-fluids, magneto-strictives).

Keywords : multiphysics, discretization, coupling, integral formulation

Programme

1 / Discretization of problems
Case of media without flow: Integral formulations; Variational formulations.
Case of flowing fluids: Finite volumes, Variational formulations.
2 / Fluid-structure coupling
Vibro-acoustics of structures coupled to a compressible and non-compressible fluid.
Calculation of the behavior of structures subjected to a fluid flow.
3 / Thermo-mechanical coupling
Formulation of thermo-mechanical problems
Calculation of stationary and transient behaviors. Application to the braking system.

Learning outcomes

- Understanding the complexity of a multiphysics problem
- Knowing how to formulate a coupling between two physics
- Know the tools adapted to the resolution of a multiphysics problem
- Knowing how to analyze and criticize the results of the resolution

Independent study

Objectifs : This activity is not concerned with framed autonomy activities outside personal work.

Méhodes : This activity is not concerned with framed autonomy activities outside personal work.

Core texts

F. Brezzi & M. Fortin, *MIXED AND HYBRID FINITE ELEMENT METHODS.*
C.A. Bredia, S. Kim, T.A. Osswald & H. Power *BOUNDARY ELEMENTS XVII.*
Klauss J. Bathe*FINITE ELEMENT PROCEDURES IN ENGINEERING ANALYSIS.*

Assessment

Final mark = 50% Knowledge + 50% Know-how
Knowledge N1 = 100% final exam
Know-how N2 = 100% continuous assessment