Finite element modeling fundamentals

Perfect your use of the finite element method and understand how it is applied to solving large deformation issues. This way you can improve the quality of your results with a better understanding of numerical aspects. This is one of the challenges of this training course!

During this course, you will cover the essentials of finite element modeling and apply it to the mechanics of continuous environments. This day lets participants broaden their numerical knowledge ready for putting Transvalor software solutions to more intense use, especially FORGE® & COLDFORM®. You will study the fundamentals linked to mechanical and thermal solvers, meshing and remeshing as well as the differences between formulations (Lagrangian, Eulerian or ALE).

Through examples and during the simulation analysis workshops, participants will be able to understand the impact that numerical parameters have on the results obtained.

LEVEL

Beginner - Users wishing to expand their numerical knowledge in the field of finite element simulation and modeling.

PREREQUISITES

There are no prior requirements for this course.

GOALS

- **Knowing the basics of finite element in order to make better use of our products and take advantage from the simulation**
- **Understanding the fundamentals of the finite element method: from the thermal equation to the mechanics**
- **Gaining a more in-depth knowledge of space and time discretization**
- **Mastering meshing and remeshing principles**
- **Learning how to determine material behavior**
- **Checking the impact of numerical parameters on the end result**

OTHER RECOMMENDED COURSES

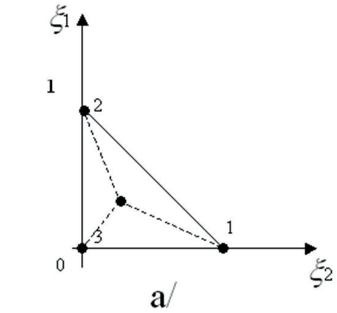
- Starting with FORGE®
- FORGE® - Die analysis

DURATION	DATES 2023		
1 Day	18 January	10 May	12 September

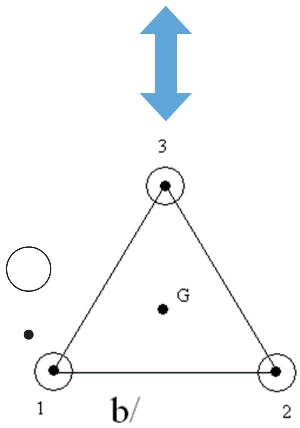
TRAINING	PRICE EXCL. TAX	PARTICIPANTS
Inter-company	540 € per person	3 to 8 people
In-company	1300 € per training	1 to 3 people

DAY 1 > 8.30 a.m. to 12.00 p.m. & 1.30 p.m. to 5.00 p.m.

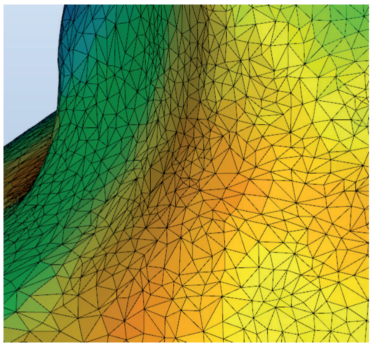
Introduction	Genera presentation Course goa s
Numerical simulation	Why numerica simu ation is usefu for forming materia s Rea ife examp es
Introduction to the finite element method	Finite e ement method princip e Space and time discretization nterpo ation function Boundary conditions
Domain discretization and formulation	Mesh and e ement types Mesh surface and density qua ity criteria Lagrangian or Eu erian formu ation Remeshing ALE method
Handling symmetries	2D axisymmetric or 2D deformation p ane 3D with symmetry mpact of symmetries on computation time Resu t ana ysis
Handling the contact	Definition and types Contact distance ca cu ation Pena ized contact Deformab e mu tibody contact
Mechanical and thermal problem resolution	NO inear behavior reso ution Mechanica and therma formu ation Direct or iterative so ver method Time step management Geometry updating Transfer of fie ds Mechanica Therma Meta urgica coup ing Diffusion equation reso ution
Material behavior	Behaviors: visco p astic, e asto p astic, p astic and e astic Thermo dependence and sensitivity to the deformation rate P asticity criteria and f ow stress concept sotropy and anisotropy
Exercices	Mandatory data Mode ing stages App ying post processing to mechanics
Conclusions	Questions and course assessment



A mini-element, 3 node triangle also called P1+/P1



Pressure degrees of freedom
Velocity degrees of freedom



Transvalor products tetrahedral mesh