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.

During this course, you will cover the essentials of finite element modeling and apply it to continuum mechanics.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: applied to thermal and mechanical aspects**
- **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

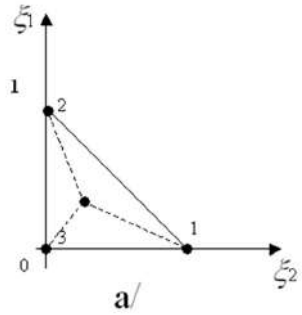
- Starting with FORGE®
- FORGE® - Die analysis

DURATION	DATES 2024		
1 Day	17 January	22 May	17 September

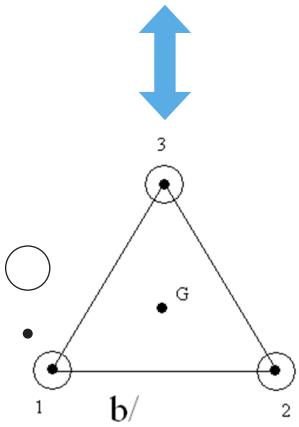
TRAINING	PRICE EXCL. TAX	PARTICIPANTS
Inter-company	580 € per person	3 to 8 people
In-company	1400 € per training	1 to 3 people

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

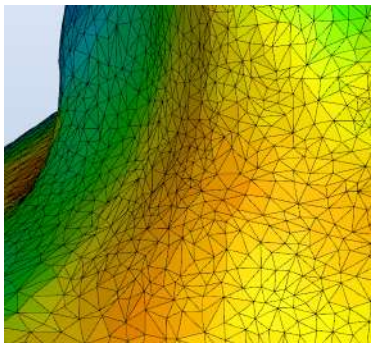
Introduction	· General presentation · Course goals
Numerical simulation	· Why numerical simulation is useful for forming materials · Real-life examples
Introduction to the finite element method	· Finite element method principle · Space and time discretization · Interpolation function · Boundary conditions
Domain discretization and formulation	· Mesh and element types · Mesh surface and density quality criteria · Lagrangian or Eulerian formulation · Remeshing · ALE method
Handling symmetries	· 2D axisymmetric or 2D deformation plane · 3D with symmetry · Impact of symmetries on computation time · Result analysis
Dealing with contact	· Definition and types · Contact distance calculation · Penalized contact · Deformable multibody contact
Mechanical and thermal problem resolution	· Non-linear behavior resolution · Mechanical and thermal formulation · Direct or iterative solver method · Time increment management · Geometry updating · Transfer of fields · Mechanical-Thermal-Metallurgical coupling · Diffusion equation resolution
Material behavior	· Behaviors: visco-plastic, elasto-plastic, plastic and elastic · Thermo-dependence and sensitivity to the deformation rate · Plasticity criteria and flow stress concept · Isotropy and anisotropy
Exercices	· Necessary data · Modeling stages · Applying 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

TRANSVALOR A NEW GENERATION SIMULATION EXPERIENCE