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## Nonlinear Implicit Analysis

**Instructor:** Dr. Nils Karajan (nils.karajan@dynamore.com)

**1 Day - \$200, Students \$100** w/student ID

Includes on-site continental breakfast, lunch, breaks and class notes

Includes 30-day LS-DYNA® demo license to practice

**Prerequisite:** Attendees should have basic LS-DYNA® experience.

**Description:** The implicit solver of LS-DYNA® is well suited to handle many challenging applications, thereby coping with large deformations, difficult contact situation and material nonlinearities. With respect to the latter, there are many advanced material models available that are suitable for both explicit and implicit analysis. Moreover, the scalability on many CPU cores is very good, which allows for the treatment of large scale problems with several millions of unknown degrees of freedom.

The goal of this one-day seminar is to present a brief, practical introduction to some of the implicit capabilities in LS-DYNA with a focus on typical nonlinear structural analysis. This class is a condensed version of the two-day class "Implicit Analysis with LS-DYNA" and thus, topics related to eigenvalue, modal, and buckling analysis as well as frequency response functions and implicit/explicit switching are omitted.

The course is suited for engineers having some previous experience with the explicit solver of LS-DYNA, user who want to extend their basic knowledge in using the implicit solver of LS-DYNA or for experienced users of other implicit FE-programs.

### Contents:

- Introduction to the implicit solver
  - Differences to explicit time integration
  - Overview on implicit analysis types and involved keywords
- Linear static analysis
  - Elements, direct and iterative solver settings, memory, etc.
- Dynamic implicit analysis
  - Available time integration schemes, switching between dynamic and static analysis
- Nonlinear implicit static and dynamic analysis
  - Origins of nonlinearity and differences to linear analysis
  - Nonlinear solution procedure, convergence measures and time step control
- Material models and elements suitable for implicit analysis
- Loads, boundary conditions and constraints
- Contact definitions, tips and tricks
- Troubleshooting convergence problems
- Output format and output files