Introductory LS-OPT Training Class

A short course taught by: Nielen Stander, Ph.D.

Class Location: **Livermore Software Technology Corporation**
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Objective of the course
This 3-½ day course is an introduction to the use of the optimization code LS-OPT for optimal design. An emphasis is placed on interfacing with LS-DYNA. Both basic theoretical concepts of optimization as well as practical aspects of optimal design are covered. The course includes workshop sessions in which the theoretical topics of the day will be applied.

Who should attend
This seminar is intended to enable engineers with basic knowledge of LS-DYNA to become more productive in design and parameter identification. An introductory class in LS-DYNA is therefore a prerequisite. Optimization knowledge is not required.

Lectures begin daily at 9:00 a.m. and run until 5:30 p.m., except for the last day when the course concludes at 12:00 p.m. The classroom machines are PCs running on the Linux operating system.

COURSE CONTENTS: Over the duration of the class, students work in groups of two (sometimes individually) to work/solve the exercises. The exercises are simple, so that they take a short time to run, but contain enough complexity to give insight into the optimization process. Most of the problems are nonlinear (large deformation) dynamic and will be solved using LS-DYNA simulation. If time allows, new, more advanced features such as multidisciplinary design optimization will be demonstrated.

SECTION 1
Course Outline
Introduction to Design Optimization using industrial examples
LS-OPT features
Theory: Formulation
- Optimality criteria
- Gradient computation
- Response Surface Methodology
- Experimental Design
- Design model adequacy checking
- Successive approximations
- Design scenarios

SECTION 2
Command Language
- Command File structure
- Program execution
- Job Monitoring
- Restarting
- Database and output
- Preparation and test procedure
- Experimental design options
- Response extraction
- Response surface options
- Simple design formulation

SECTION 3
LS-DYNA interface features
- ASCII database
- Binary database
- Filtering
- Time history functions
- Injury criteria
- Metal forming criteria: FLD, thickness

Interfacing a parametric preprocessor
Design formulation
- Composite functions
- Min.-Max

Iterative design

SECTION 4
Trade-Off studies
Exercise problems:
- Polynomial optimization problems
- Crashworthiness
- Parameter Identification
- Sheet metal forming
- Other nonlinear examples