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NVH and Frequency Domain Analysis with LS-DYNA®

Instructor: Yun Huang, LSTC
2 Days : $400 Students $200 w/student ID
Includes on site continental breakfasts, lunches, breaks
Includes 30-day LS-DYNA demo license to practice

Prerequisite: **Introduction to LS-DYNA Class.**
Students should have a command of the LS-DYNA keywords and options associated with Foam and Viscoelastic Materials

Objective
The objective of the two day training course is to introduce the frequency domain vibration, fatigue and acoustic features of LS-DYNA to users, and give a detailed look at the application of these features in vehicle NVH simulation.

COURSE CONTENT

- Introduction
  - NVH Theory and lab testing technology
  - Overview of LS-DYNA frequency domain features and applications
  - Frequency domain analysis vs. Time domain analysis
  - Fourier transform
- FRF
  - Modal superposition method
  - Damping
  - Nodal force / Resultant force FRF
- SSD
  - Large mass method
  - ERP (Equivalent Radiated Power)
  - Mode expansion with LS-PrePost
  - Mode contribution fraction plot
- Random vibration with PSD loading
  - Correlated and uncorrelated multiple excitations
  - Acoustic waves
  - Pre-stress condition
- Acoustics
  - BEM, FEM
  - Vibro-acoustics
  - Incident waves
  - Acoustic panel / element contribution analysis
  - ATV and MATV
  - Frequency weighted SPL (dB)
  - Radiated sound power, radiation efficiency
  - Acoustic eigenvalue analysis

- Response spectrum analysis
  - Input earthquake spectrum
  - Modal combination methods (SRSS, CQC, etc.)
  - Multi input spectra
  - DDAM
- Fatigue
  - Fatigue analysis in harmonic / random vibration environment
  - Miner's rule
  - S-N curves
  - Dirlik Method
  - Mean stress correction
- Advanced topics
  - SEA (Statistical Energy Analysis)
  - Brake Squeal Analysis
  - NVH analysis based on IGA
- Auto NVH examples
  - FRF on BIW
  - Noise Transfer Functions (NTF)
  - Vehicle interior noise
  - Muffler Transmission Loss Analysis
- Workshop
  - Hands-on exercise
  - Post-processing of binary and ASCII databases (d3ssd, d3acs, d3ftg, nodout_ssd, elout_ssd, etc.)