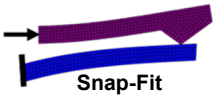
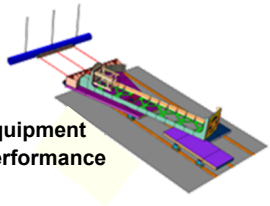
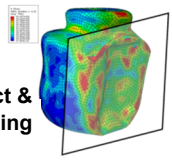
Analyzing Noisy Data from FEA & Physical Tests via DSP – FFT, SRS, Filters & More

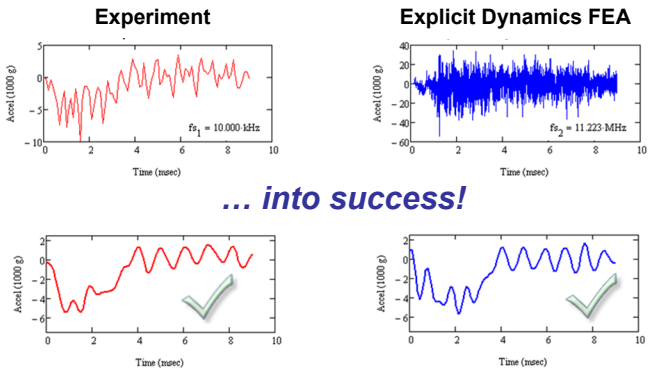
Customizable Training Seminar
Instructor: Ted Diehl, PhD


Snap-Fit


Equipment Performance

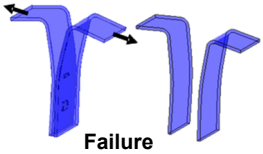

Impact & Buckling

Learn

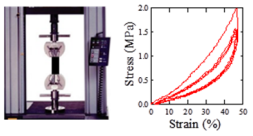


… into success!

Training specially designed for FEA Users & Test Engineers


Failure


Drop Testing



Advanced Material Testing

Course Description

Have you struggled with noisy data from either implicit or explicit FEA simulations and/or measurements?
⇒ Not sure what filtering, FFT, PSD, SRS, PVSS, and other DSP tools are really doing to your data?

Training seminar teaches required concepts for working with noisy/transient data - from both measurements and simulations. This seminar is taught in the language of Mechanical Engineering and provides a fundamental understanding of DSP theory and its application to the field of nonlinear structural mechanics.

Benefits of Training

- Learn how to collect digital data, avoiding **aliasing**. Applies to physical testing & simulation models.
- Perform spectrum analysis to interpret frequency content via DFS (so-called FFT) and PSD analysis.
- Filter data with confidence to remove high frequency noise or low frequency drifting.
- Apply SRS & PVSS shock spectrum methods to estimate impact severity, including estimating influence of a shock isolator and how to convert simple shock specs (1000·G, 0.5·msec) into SRS and PVSS spectra.
- Improve accuracy, efficiency, and usefulness of explicit dynamics simulations (Abaqus, LS-Dyna, Radioss...) including impact, shock, buckling, failure, penetration, sliding contact, and quasi-static analyses.
- Obtain better correlations between physical tests and FEA simulations. Learn:
  - ✓ Sources that cause distortions in physical tests and simulations and then how to potentially remove them.
  - ✓ How to make appropriate comparisons between simulations and physical tests.
  - ✓ How to get BOTH the measurement/test engineer and simulation user on the same page!

"Your DSP course taught techniques that helped me create a standardized approach for processing noisy Explicit Dynamics simulations. This has improved my analysis and helped me deliver more useful FEA results on recent projects - your course is the best I have taken in a long time."

Michael J. Iacchei, Mechanical Engineer, U.S. Army, AMSAA

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Analyzing Noisy Data from FEA & Physical Tests ...

Lectures ✓ - briefly covered , ✓✓ - covered in detail	1-Day Course	4-Day Course
1) Motivation for Using DSP with Simulations and Experiments	✓	✓✓
2) DSP Fundamentals	✓	✓✓
3) Shock Spectrum Analysis (SRS, PVSS)	✓	✓✓
4) Using Energy to Enhance Analysis		✓✓
5) DSP Using Various Software	✓	✓✓
6) Developing a DSP Strategy for a Given Problem	✓	✓✓
7) Working with Physical Measurements and Validating Simulations/ Experiments		✓✓
8) Working with Transient-Dynamic Models	✓	✓✓
9) Improving the Modeling of Failure	✓	✓✓
10) Working with Quasi-Static Models from Explicit FEA	✓	✓✓
11) Creating Viable FEA Material Data from Noisy and Messy Physical Data		✓✓
Workshops Solutions provided in Kornucopia® ML (w/ MATLAB®) & Abaqus®		
ASCII files and avi videos provided so attendees can use software of their choice.		✓✓
1) Experiencing Common DSP-related Mistakes		✓✓
2) Learning DSP Using Simple Signals		✓✓
3)Transient Impact of a Container, Including SRS and PVSS Assessments		✓✓
4) Transient Penetration - Comparing Models and an Experiment		✓✓
5) Salvaging Shock Data via Highpass Filtering		✓✓
6) Quasi-Static Cam Mechanism		✓✓
7) Analyzing Failure and Crack Propagation		✓✓
8) Computing Derivatives and Integrals From Noisy Data		✓✓
9) Creating Elastic/Plastic Material Law From Slightly Noisy Experimental Data		✓✓
10) Cleaning Problematic Hysteresis Data		✓✓

Who Should Attend

Engineers, scientists, and technicians working with any of the following:

- Assessment of shock, impact, blast, failure, penetration, buckling, contact, or other noisy events.
- Simulations ranging from highly transient to vibratory to noisy quasi-static, especially those from explicit dynamics codes (Abaqus, LS-Dyna, Radioss, and others).
- Experimentally measured data of frequency rich, noisy events or messy/challenging data.

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