

# LS-DYNA® TRAINING

## By Predictive Engineering

### Implicit and Explicit Nonlinear Transient Analysis for Structural Mechanics



**Duration:** 32 hours (four, 8-hr sessions)  
**When:** Apr 25 (Monday) to 28 (Thursday), 2022  
**Where:** Live in-person training Portland, Oregon, USA  
**Cost:** \$3,250.00

**Optional Day:** Apr 29 (Friday) – Troubleshooting nonlinear implicit analyses to achieve quick and accurate convergence.  
**Duration:** 5 hours, 8:00 am to 1:00 pm with 15 min break at 10:30 am.  
**Cost:** \$580.00

**What's Included:** Digital course training manual, notes and workshop videos provided via Google Drive or upon arrival via USB stick. Laptops can be provided with LS-DYNA license for an extra \$435/student. Otherwise, it is expected that students will have their own laptops with access to LS-DYNA license. This Course qualifies for 32-hs of professional continuing education credits.

**Know Your Class:** Monday – Evening social and dinner 5:00 to 8:00 pm; Wednesday – PDX Micro-Brewery Bike Tour (weather permitting) 5:00 to 7:00 pm. Social events and bikes are hosted and provided by Predictive Engineering.

**Registration:** Early registration is encouraged since space is limited to 15 students and it is expected that the class will fill. Class hours are 8:00 am to 5:00 pm with 15 min breaks at 10:00 am and 3:00 pm and 45 minutes for lunch.

To register please send email to:  
[Training@PredictiveEngineering.com](mailto:Training@PredictiveEngineering.com)  
Attn: George Laird, PhD, PE

#### About Predictive Engineering

Based in Portland, Oregon, Predictive has 20+ years of experience with LS-DYNA sales, consulting, services and training.

References available at our website:  
[www.PredictiveEngineering.com](http://www.PredictiveEngineering.com)



## Engineering Short Course

This one week-long course is directed toward the engineering professional simulating highly nonlinear static and transient dynamic problems involving large deformations and contact between multiple bodies. Our goal is to provide a realistic foundation toward the practical usage of LS-DYNA as we have used it on hundreds of simulation projects.

The course is fast paced and follows the scientifically proven method that flows from lecture (theory) to hands-on examples (workshops). All workshops are provided in video format for later review by the students.

## Course Outline

### Theoretical Foundation

- I. Implicit versus Explicit
- II. Explicit Time Step - CFL (Workshop)
- III. Mass Scaling – CMS/SMS (Workshop)
- IV. Meshing for Explicit Success (Workshop)
- V. Explicit Element Technology (Workshop)

### LSPP & Material Modeling

- I. LS-PrePost Philosophy (Workshop)
- II. Material Modeling: Metals, Elastomers, Foams (Workshop)
- III. Equation of State (EOS)
- IV. Material Failure & Fracture (Workshop)
- V. Rigid Bodies (Workshop)

### Contact & Load Initialization

- I. Contact Theory & Application (Workshop)
- II. Edge-to-Edge Contact & Other Pathologies (Workshop)
- III. Tied-Contact: Mesh Transitions, Gluing, Welding (Workshop)
- IV. Negative Sliding Interface Energy (Workshop)
- V. Implicit-to-Explicit Switching: Load Initialization (Workshop)

### Drop Test, Damping & Bird Strike (SPH)

- I. Dynamic Relaxation for Bolt Preload (Workshop)
- II. Damping (Workshop)
- III. Drop Test Simulation (Workshop)
- IV. Smoothed Particle Hydrodynamics (Workshop)
- V. Bird Strike / Ballistic Impact (Workshop)

### Implicit Analysis: Linear to Nonlinear to Vibration

- I. Observations on Implicit versus Explicit Analysis
- II. Implicit analysis: Linear, Static Stress Analysis (Workshop)
- III. Nonlinear Implicit Analysis with Mortar Contact (Workshop)
- IV. Troubleshooting Nonlinear Implicit Analyses (Workshop)
- V. Normal Modes Analysis, Sine Sweep and PSD Analyses
- VI. PSD Analysis with Fatigue Assessment (Workshop)
- VII. Q&A

### Optional Extra Day: Troubleshooting Implicit Analyses

- I. Understanding implicit convergence indicators
- II. Techniques to quickly achieve convergence (Workshop)
- III. When nothing else works – Diverging Solution (Workshop)
- IV. Best Practices from Start-to-Finish