



**Livermore Software Technology Corp.**

*Locations:*

7374 Las Positas Rd, Livermore, CA 94551

1740 West Big Beaver Rd, Troy, MI 48084

Contact: [classes@lstc.com](mailto:classes@lstc.com) [www.lstc.com/training](http://www.lstc.com/training)

## **Blast Using LS-DYNA**

**Instructor: Dr. Ala (AI) Tabiei** [atabiei@lsdyna-online.com](mailto:atabiei@lsdyna-online.com)

**2 Days - \$1,000 Students \$500** w/student ID

Includes on-site continental breakfasts, lunches, breaks, class dinner

Includes 30-day LS-DYNA demo license to practice

**Description:** This training class will provide analysts with the additional tools and knowledge required to model high energy events. The typical attendee is likely to have a background in defense applications, such as protective structures and vehicles, Homeland Defense topics, and terrorist threat mitigation design techniques. Attendees will use LS-DYNA keywords and options associated with typical Lagrangian analyses to solve blast, vehicles (IED and mines), and home land security problems. Some mathematical theory is presented for each technique, especially Eulerian and Mesh-free Methods, to provide the user with sufficient knowledge to apply the appropriate analysis technique. Examples are used to illustrate the points made in the lectures and train engineers on using the code.

### **Course Contents:**

#### **1. Introduction**

- **Introduction to Wave Propagation**
  - Wave propagation in incompressible material
  - Wave propagation in compressible material
- **Blast Effects**
- **Numerical Techniques to Solve High-energy Problems**
  - Lagrangian, Eulerian and ALE, SPH, EFG, DEM
- **Load\_Blast\_Enhanced & INITIAL\_IMPULSE\_MINE**

#### **2. Blast Wave Simulations Techniques**

- **Applications**
  - Vehicles
  - Underwater Structures
  - Energy Balance

#### **3. Material Behavior Under Severe Loading**

- Strain Rate Effect
- Material Models Library
- What is Available That Works for the Defense Problems
- Isotropic
- Composites
- Soil
- Concrete

#### **4. Bomb Modeling**

- Shape charges, EFP, & IED
- Bomb fragmentation modeling

#### **5. Hybrid-III Dummy Response to Blast**

- Dummy models
- Dummy response to blast

#### **6. Modeling Techniques**

- Mesh design
- Problem initialization
- Post-processing

#### **7. Impact Data Reduction and Analysis**

- Filtering the data
- Intermittent eigen value analysis

#### **8. Introduction to FSI**

#### **9. Introduction to SPH**

#### **10. Blast Mitigation Structures**

(Literature review, no lecture)

#### **11. References**