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## Penetration 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, to include protective structures and Defense topics, and terrorist threat mitigation design techniques using simulation. Attendees will use LS-DYNA keywords and options associated with typical Lagrangian analyses to solve penetration, perforation, and protective structures 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

- Numerical Techniques to Solve High-energy Problems
  - Lagrangian
  - Eulerian and ALE
  - SPH & EFG
- Sample Applications

#### 2. Introduction to FSI

- Penetration Problems

#### 3. Introduction to SPH

- Penetration Problems

#### 4. Penetration

- Penetration Simulations Techniques
- Applications

#### 5. Material Behavior Under Severe Loading

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

#### 6. Failure and Damage Modeling

- Fracture
- Damage
- Element Erosion
- Non-local Mat

#### 7. Modeling Techniques I

- Explosively formed projectiles
- Shape charges
- Fragmentation modeling

#### 8. Modeling Techniques II

- Mesh design
- Problem initialization
- Post-processing

#### 9. Impact Data Reduction and Analysis

- Intermittent eigen value analysis
- FFT and Filtering

#### 10. References