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## **User-Defined Materials (UMAT) in LS-DYNA**

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

**2 Days - \$1,250    Students \$625 w/student ID**

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

Includes 30-day LS-DYNA demo license to practice

**Description:** This is a short course on using the user-defined materials in LS-DYNA. This class will provide analysts with the additional tools and knowledge required to model and implement their own material model in LS-DYNA. Workshop examples are used to illustrate the points made in the lectures and train engineers on using the code. The course will provide users with experience in running and trouble-shooting LS-DYNA UserMat analysis.

### **Course Contents:**

Chapter 0: Outline

Chapter 1: Introduction and Objective

- Subroutine Flow in the Fortran Files

Chapter 2: Introduction to Nonlinear Continuum Mechanics

Chapter 3: The Nonlinear Finite Element Dynamic Equation

Chapter 4: Material Constitutive Equations

Chapter 5: Steps Required in Writing a UserMat

Chapter 6: User-defined Material Subroutines: Elastic

- Elastic Material (shell and solid subroutines)
- Orthotropic Material
- Hyperelastic Material Subroutine
- Viscoelastic Material Subroutine

Chapter 7: User-defined Material Subroutines: Plastic

- Plasticity & the Radial Return Algorithm
- Elastic Plastic Material Subroutine
- Piecewise Plasticity Subroutine
- Strain Rate Depended Subroutine

Chapter 8: Failure & User-defined Subroutines

- Failed Element & Nodes

Chapter 9: Implicit User-defined Subroutines

- Elastic Isotropic Material
- Nonlinear Composite Material

Chapter 10: Other Applications in User-defined Subroutines

- Temperature
- EOS

Chapter 11: References & Other Courses