

# Seismic Site Response Analysis with *GeoMotions Suite 2000*

## Friday, July 9 & Saturday, July 10, 2010

### Los Angeles, California

#### Course Overview

This short course is designed to teach 21<sup>st</sup> century professionals how to evaluate seismic hazard and perform time history site response analyses using *GeoMotions Suite 2000*. This software suite includes the NGA attenuation relationships; RspMatchEDT, a program for generation of spectrum-compatible ground motions; a Newmark-type seismic deformation analysis program; and our flagship equivalent-linear and nonlinear effective-stress site response analysis programs SHAKE2000 and D-MOD2000. Hands-on training in the use of the *GeoMotions Suite 2000* programs is an essential part of this short course.

#### What will you learn?

You will learn from practicing professionals how to apply SHAKE2000 and D-MOD2000 to solve common earthquake engineering problems. Topics addressed during this short course include:

- Evaluation of seismic hazard parameters (probabilistic and deterministic) and development of design ground motions.
- Principles of dynamic modeling (1-D, 2-D, and 3-D).
- Evaluation of dynamic material properties and dynamic model parameters.
- Generic (i.e., published) sets of material parameters for site response analyses.
- Newmark-type seismic deformation analysis in engineering practice.

- Soil liquefaction and slope stability analyses using the site response analysis results.
- Documentation of results to aid in the regulatory approval of site response and seismic deformation analyses.

Assistance with installation and running of *GeoMotions Suite 2000* programs will be provided.

#### Course Level

This short course is designed for practicing professionals with formal education in engineering and/or earth sciences.

#### Instructors

**Neven Matasovic, Ph.D., P.E., G.E.** is an Associate with Geosyntec Consultants. He holds a Ph.D. in Geotechnical Earthquake Engineering (UCLA) and M.S. degree in Structural (Foundation) Engineering. He is developer of D-MOD2000, recipient of the 2001 Prakash Foundation Award for Excellence in Practice of Geotechnical Earthquake Engineering, and author/co-author of over 70 technical publications including the Federal Highway Administration (FHWA) guidance document on geotechnical earthquake engineering for highway facilities and of the US Environmental Protection Agency (EPA) guidance document for seismic design of landfills.

**Gustavo A. Ordonez, P.E.**, received his B.S. in Civil Engineering from the University of San Carlos of Guatemala and his M.S. degree in

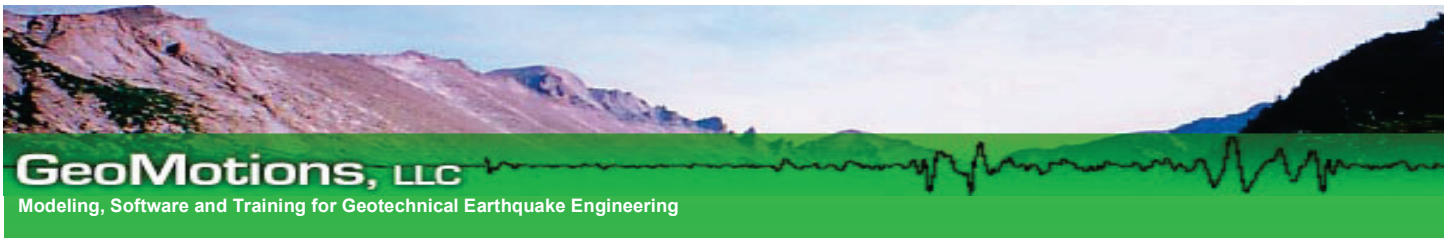
Geotechnical Engineering from Oregon State University. He has 19 years of professional experience with emphasis on the field inspection of existing dams and on the evaluation of their static and seismic adequacy under current engineering standards. He is a seasoned programmer and geotechnical earthquake engineering application code developer.

#### Invited Speaker

**John G. Diehl, P.E.** is President of GEOVision, Inc. of Corona, California. He holds M.S. (Engineering) and MBA degrees from the University of California Los Angeles (UCLA). Mr. Diehl's experience includes shear wave velocity measurements with a variety of techniques (OYO Suspension Logging, SASW, MASW, REMI, cross-hole/in-hole/down-hole), full spectrum of vibration measurements, including ambient vibrations, and modal analysis of full size structures, including dams, offshore platforms, and buildings. He authored and co-authored over 20 publications related to shear wave velocity and vibrations measurements.

#### Registration Information

- Advance registration and payment are required. Registration will be on a first-come/first-served basis. Space is limited to 20 participants.
- To pre-register, send an e-mail to: [training@geomotions.com](mailto:training@geomotions.com)
- Cost of one *GeoMotions Suite 2000* license/hard lock key is included in the registration fee.



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- The registration fee is \$1,000.00 for payment by check/bank wire or \$1,075.00 for credit card payment. Please contact us for credit card and bank wire payments.
- Cancellations accepted and partial refunds provided on/or before June 30, 2010. A \$100.00 handling fee will be deducted from refunds. After that date, either: 1) no refunds will be offered, instead another person(s) may substitute those unable to attend; or, 2) the software will be shipped to the registered participant.
- **Short course participants are required to bring their own laptops (for participation in the hands-on software training sessions).** A working knowledge of computers and experience in the use of software for the design and/or analysis of engineered structures is required from the participants.
- The short course will be held at:

**Holiday Inn Los Angeles  
International Airport  
9901 La Cienega Blvd.  
Los Angeles, CA 90045**

**Tel.: (310) 649-5151  
www.hilax.com**

- The hotel is holding a block of rooms at the GeoMotions group rate of \$109.00 plus tax per night. Please call the hotel directly to make reservations before the cut-off date of June 18, 2010 in order to receive the discounted room rate.

- 12 PDH-s will be awarded for successful completion of the short course.
- In the event the course is cancelled by GeoMotions due to insufficient enrollment, the registration fee will be refunded in full. GeoMotions is not responsible for any other expenses associated with a cancellation.
- For additional information please contact GeoMotions at:

Tel: **(360) 259-6140**  
(GMT -08:00 - Pacific Time USA)

E-mail: [training@geomotions.com](mailto:training@geomotions.com)

### Agenda Friday, July 9<sup>th</sup>

<b>Registration</b>	<b>7:30</b>
<b>1. Introduction and Objectives</b>	<b>8:15</b>
<b>2. Seismic Hazard Parameters and Development of Design Ground Motions</b>	<b>8:30</b>
<ul style="list-style-type: none"> <li>• Introduction and Basic Definitions</li> <li>• Source Identification and Characterization</li> <li>• Source and Path Parameters</li> <li>• Use of Common Attenuation and Duration Models</li> <li>• Evaluation of Seismic Hazard Parameters</li> <li>• Development of Design Ground Motions</li> <li>• Comparison of Various Methods</li> <li>• Discussion/Questions</li> </ul>	

**Coffee Break 9:45**

### 3. Site Response Models and Dynamic Soil Properties 10:15

- Site Characterization
- Representative Soil Profile
- Soil and Bedrock Parameters for Site Response Analysis
- Shear Wave Velocity Profile
- Unit Weight Profile
- Shear Modulus, Modulus Reduction and Damping
- Material Parameters for Nonlinear Analyses (Poisson's Ratio and Hydraulic Conductivity)
- Sensitivity of Site Response Analysis to Input Parameters
- Example Problem – Turkey Flat Site Response Case History
- Discussion/Questions

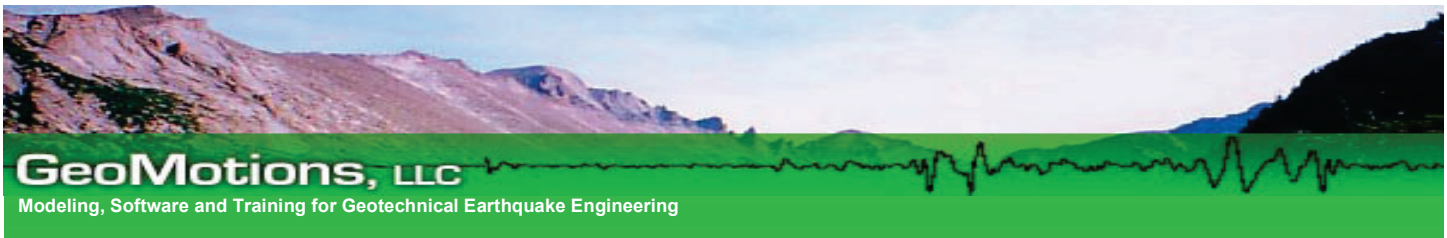
### 4. Shear Wave Velocity ( $V_s$ ) Measurements 11:15

- $V_s$  Measurement Methods (OYO, SASW, MASW, REMI, and other methods)
- Comparison and Limitations of  $V_s$  Measurement Methods
- Accuracy, Cost, Lead Time, and Measurement Time

**Lunch (on your own) 12:00**

### 5. Site Response Analysis (SHAKE2000) Hands-on Training 1:00

- Software Features
- Training Objectives & Outline
- Dynamic Model Building



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#### SHAKE2000 Hands-on Training (cont.)

- Assignment of Input Motion
- Example Model/Problem
- Acceleration & Shear Stress Time Histories
- Response Spectra

**Coffee Break 3:00**

**6. Newmark Type Analyses (SHAKE2000 Hands-on Training) 3:15**

**Questions/Answers 4:45**

#### Saturday, July 10<sup>th</sup>

**7. Role of Advanced Analyses in Geotechnical Earthquake Engineering 8:15**

- Basic Definitions
- Why and When is Nonlinear Analysis Required?
- Why and when is Effective-Stress Analysis Required?
- When are 2-D and 3-D Analyses required?
- When Soil-Structure Interaction Effects Should not be Ignored?
- What are the Limitations of 1-D Nonlinear (and Effective-Stress) Models?
- How to analyze 2-D and 3-D problems with 1-D models

**Coffee Break 9:45**

**8. Nonlinear and Effective-Stress Analyses - Theoretical Background 10:15**

- Total-Stress Analysis
  - Dynamic Response Model
  - Viscous Damping Model
  - Stress-Strain Model
  - Irregular Stress-Strain Behavior Rules
- Pore Water Pressure (PWP) Generation Models (Sand and Clay)
- Degradation Models (Sand and Clay)
- Redistribution Model for PWP (Sand) and Degradation Index (Clay)
- PWP Dissipation Model (Sand, Clay, and Composite Soil Deposits)

**Lunch (on your own) 12:00**

**9. Hands-on Modeling 1:00**

- Layer Thickness
- Transmitting vs. Rigid Boundary
- Evaluation of the Rayleigh Damping Model Parameters
- Use of Generic Model Parameters
- Generation of Nonlinear Model Parameters from Published Data
- Generation of Model Parameters from Laboratory Testing Results
- Interpretation of D-MOD2000 Output
- Modeling Tips
- “Independent” Validation of D-MOD2000

**10. Example Problems 2:00**

- Total-Stress Analysis

(Comparison with Equivalent Linear Analysis: SHAKE)

- Effective-Stress Analysis (Wildlife Site Soil Liquefaction Case History)
- Composite Soil Deposit with PWP Dissipation in Sand and Clay

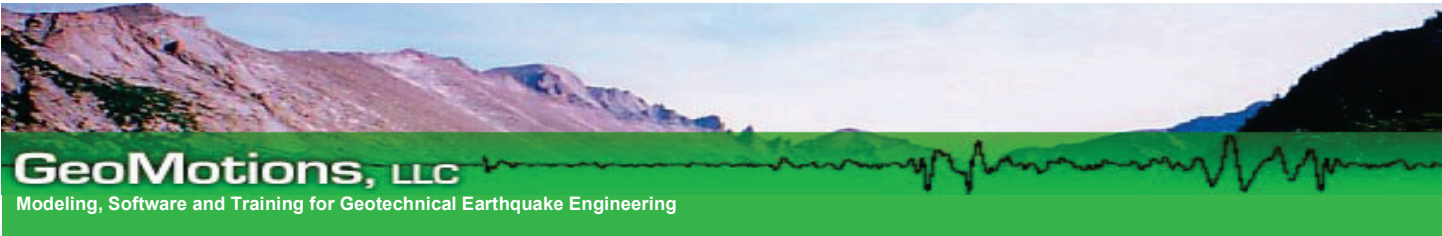
**Coffee Break 2:30**

**11. D-MOD2000 Hands-on Training 2:45**

- Problem Definition
  - How to Import SHAKE2000 Input Data into D-MOD2000
  - Nonlinear Model Building and Representative Soil Profile
  - Assignment of Input Ground Motions
  - Dynamic Soil Properties and Model Parameters
  - Analysis Control (Total-Stress/Effective Stress)
- Input of Rayleigh Damping Model Parameters
- Site Specific Response Analysis with D-MOD2000
  - Acceleration and Shear Stress Time Histories
  - Tracing of Stress-Strain Time History
  - PWP Time Histories
  - Response Spectra
  - Plotting
  - Reporting

**Closure 4:45**

- Questions/Answers
- PDH Certificates



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**Contact Information:**

Name of Firm, Organization or Individual: \_\_\_\_\_

Mailing Address: \_\_\_\_\_  
Street Address

\_\_\_\_\_  
City State Zip Code

\_\_\_\_\_  
Telephone E-mail

**Registration (\$1,000.00 check/wire; \$1,075.00 credit card):**

	Name of Attendee	E-mail	Fee
1.	_____	_____	\$ _____
2.	_____	_____	\$ _____
3.	_____	_____	\$ _____
		Subtotal:	\$ _____
	Group Discount: Firms or organizations registering 2 or more attendees deduct \$50.00 per attendee		
		_____ x 50.00	- \$ _____
		Total:	\$ _____

**Payment Information:**

Please, make check payable to: **GeoMotions, LLC** - Mail this form and payment to: **GeoMotions, LLC**  
**Attn: LAX 7/10**  
**3640 Arbor Dr. SE**  
**Lacey, WA 98503**