

## Seismic Site Response Analysis with *GeoMotions Suite 2000* Friday, December 4 & Saturday, December 5, 2009 Oakland, 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.
- Basic 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

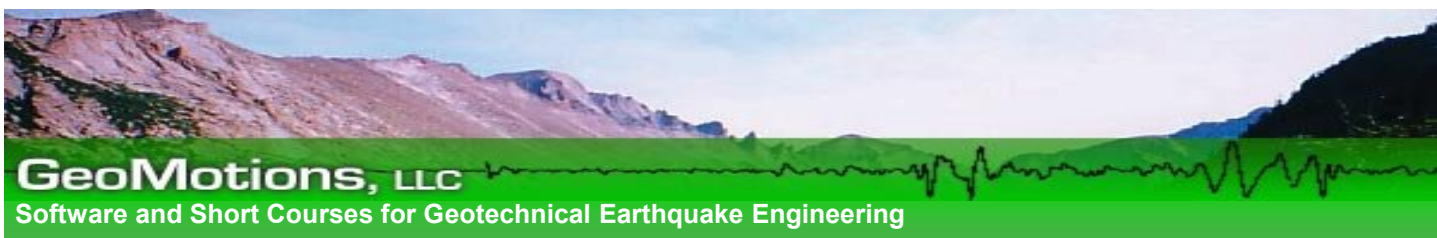
**Neven Matasovic, Ph.D., P.E., G.E.** is an Associate with Geosyntec Consultants. He holds a Ph.D. in Geotechnical Earthquake Engineering (UCLA) and M.S. degree in Structural (Foundation) Engineering. He is developer of D-MOD2000, recipient of the 2001 Prakash Foundation Award for Excellence in Practice 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: Jonathan D.

**Bray, Ph.D., P.E.** is a Professor of Geo-Engineering at the University of California, Berkeley. He earned engineering degrees from West Point (B.S.), Stanford University (M.S.), and the University of California, Berkeley (Ph.D.). Dr. Bray has been a registered professional civil engineer since 1985, and he has served as a consultant on several engineering projects, including as a peer reviewer. He has authored more than 200 research publications. His expertise includes seismic site response, dynamic soil properties, earthquake ground motions including near-fault effects, liquefaction and ground failure, seismic performance of earth and waste fills, and earthquake fault rupture propagation. He has received several honors, including ASCE Fellow, Shamsher Prakash Research Award, ASCE Huber Research Prize, Packard Foundation Fellowship, NSF Presidential Young Investigator Award, and two NAGS awards.



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**Friday, December 4 & Saturday, December 5, 2009**  
**Oakland, California**

### 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)
- 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 payments.
- **Cost of one *GeoMotions Suite 2000* license/hard lock key is included in the registration fee.**
- Cancellations accepted and partial refunds provided on/or before November 20, 2009. 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).**
- The short course will be held at:

**Holiday Inn Hotel & Suites  
Oakland Airport**  
77 Hegenberger Road  
Oakland, CA 94621

(510) 638-7777  
[www.ichotelsgroup.com](http://www.ichotelsgroup.com)

- Please contact the hotel directly for reservations.

- Please note that there is not a reserved group of rooms or special hotel rates for this event.
- 12 PDH-s will be awarded for successful completion of the short course.

For additional information please contact us at:

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

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

### Agenda Friday, December 4<sup>th</sup>

<b>Registration</b>	<b>7:30</b>
<b>1. Introduction and Objectives</b>	<b>8:15</b>
<ul style="list-style-type: none"> <li>• Introduction</li> <li>• Objectives</li> </ul>	
<b>2. Seismic Hazard Parameters and Development of Design Ground Motions</b>	<b>8:30</b>
<ul style="list-style-type: none"> <li>• Introduction</li> <li>• Source Identification and Characterization</li> <li>• Source and Path Parameters</li> <li>• Attenuation and Duration Models</li> <li>• Evaluation of Seismic Hazard Parameters</li> <li>• Development of Design Ground Motions</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 Advanced Analyses (Poisson's Ratio and Permeability)
- Sensitivity of Site Response Analysis to Input Parameters
- Example Problem – Turkey Flat Site Response Case History
- Discussion/Questions

### **4. Site Response Analysis SHAKE2000 Hands-on Training** **11:15**

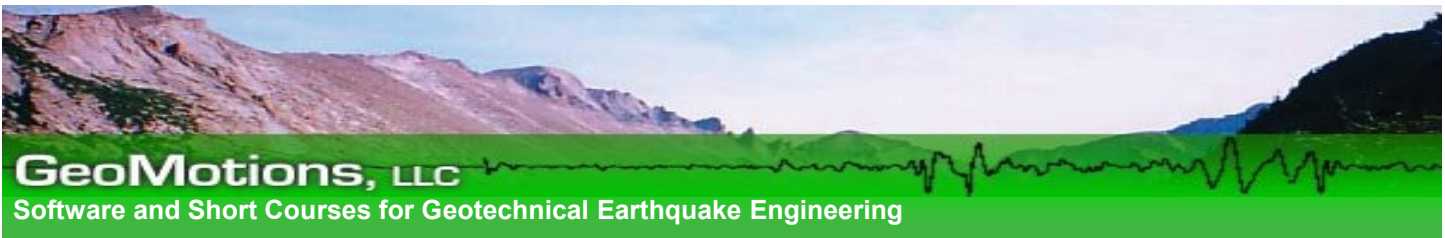
- Program Installation
- Downloads
- Dynamic Model Building

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

### **SHAKE2000 Hands-on Training (cont.)** **1:00**

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

**Coffee Break** **2:45**



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

**6. Engineering Seismicity 4:00**

- Characteristics of Near-Fault Ground Motions
- Ground Motion Predictive Relations
- Deterministic and Probabilistic Seismic Hazard Assessments
- Estimating Rock Motions for Design Purposes

**Questions/Answers 5:00**

### Saturday, December 5<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

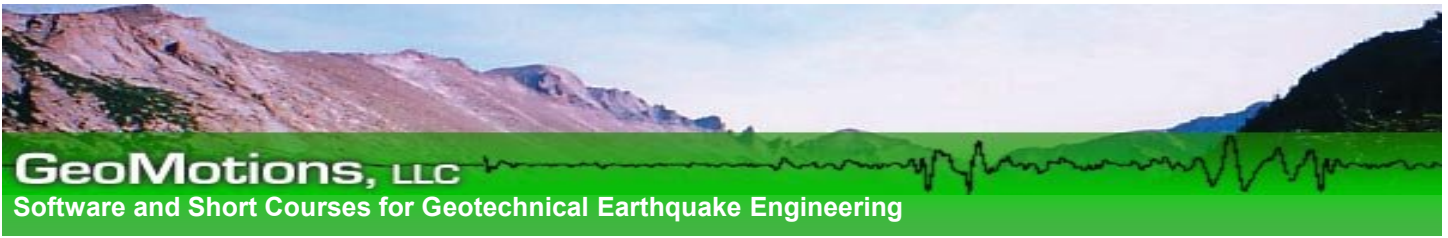
**Coffee Break 2:30**

**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



**Seismic Site Response Analysis with *GeoMotions Suite 2000***  
**Friday, December 4 & Saturday, December 5, 2009**  
**Holiday Inn Hotel & Suites Oakland Airport - Oakland, California**

**Contact Information:**

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

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

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

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

**Registration Fees (\$1,000.00 paid by check; \$1,075.00 paid by 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: OAK 12/09**  
**3640 Arbor Dr. SE**  
**Lacey, WA 98503**