

## Seismic Site Response Analysis with GeoMotions Suite 2000

Friday, May 8 & Saturday, May 9, 2009

Embassy Suites North Charleston Airport - Charleston, South Carolina

### Course Overview

This short course is designed to teach 21<sup>st</sup> century professionals how to evaluate input parameters and perform site response analyses using relevant software that will be provided as a part of the course. This software includes NGA attenuation relationships, program for generation of spectrum-compatible ground motions, equivalent-linear, nonlinear and effective-stress site response analysis programs, and Newmark-type seismic deformation analysis program. Special attention will be given to the practical aspects of site response analysis including overview of building codes, development of model material parameters, ground motion format change, and interpretation of the results. Hands-on training on the use of the computer programs will be provided.

### What will you learn?

During the short course you will learn:

- When and how to use equivalent-linear, nonlinear and effective stress site response analyses.
- The limitations of various types of site response analyses.
- Determination of soil properties for ground response analysis.
- How to conduct nonlinear and effective-stress analyses using generic material parameters.
- Fundamentals of Newmark-type seismic deformation analysis.
- How to evaluate nonlinear material parameters from published information.

- How to interpret and document the results of nonlinear and effective-stress analyses.
- How to calibrate 2-D FLAC<sup>TM</sup> models using D-MOD2000.
- Hands-on training with SHAKE2000 & D-MOD2000, including assistance with installation, running of the program and interpretation of the results.

### Course Level

This short course is designed for professionals with MS or higher degree in geotechnical and/or geological engineering or geology.

### Instructors

**Neven Matasovic, Ph.D., P.E., G.E.** is an Associate with Geosyntec Consultants. He holds a Ph.D. degree in Geotechnical Engineering from the University of California, Los Angeles and is a recipient of the 2001 Prakash Foundation Award for Excellence in Practice of Geotechnical Earthquake Engineering. He is co-author of 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.

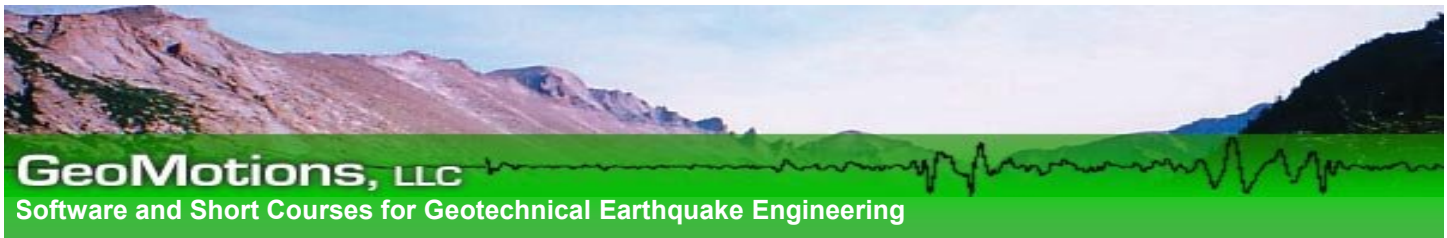
**Gustavo A. Ordonez, P.E.** received his B.S. in Civil Engineering from the University of San Carlos of Guatemala and his M.S. degree in Geotechnical Engineering from Oregon State University. He has 19 years of professional experience with

emphasis on the field inspection of existing dams and on the evaluation of their static and seismic adequacy under current engineering standards. He is also experienced in the use and development of geotechnical earthquake engineering software.

Invited speaker: **William M. Camp, III, P.E.** is a Technical Principal, Vice President and Senior Geotechnical Engineer with S&ME, Inc. and is based in the Charleston, SC office. During his 20 year tenure with S&ME, his primary activities have focused on site characterization, design and testing of deep foundations, earthquake engineering and development of soft ground sites. He serves on the Geo-Institute's Deep Foundation Committee and ASCE's Seismic Design of Piers and Wharves Standards Committee. Billy Camp received a BSCE from University of Virginia in 1986 and a MSCE from University of Texas at Austin in 1988.

### Registration Information:

- Advance registration is 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)
- Pre-registration will reserve you a spot for two weeks, during which time we must receive your payment or your spot will be opened for someone else. Registration deadline is **April 27, 2009**.



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- The registration fee is \$850.00 for payment by check or \$925.00 for credit card payment. Please call GeoMotions (9-5 PST) for credit card payments.
- A \$100.00 handling fee will be deducted from refunds. Another person(s) may substitute those unable to attend.
- **Short course participants are required to bring their own laptops for participation in the hands-on software training sessions.**
- 12 PDH-s will be awarded for successful completion of the short course.
- **One software suite license, a USB Hardware Key and free technical support are included with the registration fee.**

The short course will be held at:

**Embassy Suites North Charleston Airport**

5055 International Boulevard  
North Charleston, SC 29418

(843) 747-1882  
www.embassysuites.com

Please contact the hotel directly to make your reservations.

If you have any questions, or would like to obtain additional information, please contact us at (360) 259-6140, or send us an e-mail at:

training@geomotions.com  
www.geomotions.com

**Agenda  
Friday, May 8**

**Registration 7:30**

**1. Introduction and Objectives 8:15**

- Introductions
- Course Philosophy

**2. Evaluation of Seismic Hazard Parameters & Ground Motions 8:30**

- Seismic Hazard Analysis
- Deterministic SHA
  - Identification and Characterization of Sources
  - Selection of Source-Distance Parameter
  - Selection of Controlling Earthquake
  - Definition of Hazard Using Controlling Earthquake

- Development of Ground Motion Histories
- Site Response Analyses
- Discussion/Questions

**Coffee Break 9:45**

**3. Evaluation of Dynamic Soil Properties 10:15**

- Site Characterization
  - Soil Profile
  - Soil and bedrock Parameters for Site Response Analysis

- Shear Wave Velocity
  - From Velocity measurements
  - From SPT and CPT
- Poisson's Ratio
- Unit Weight
- Hydraulic Conductivity
- Shear Modulus
- Modulus Reduction and Damping
- Sensitivity of Site response Analysis to Input Parameters
  - $V_s$  and Unit Weight
  - Modulus and Damping
  - Ground Motions
- Discussion/Questions

**4. Seismic Site Response Analysis - Local Practice 11:15**

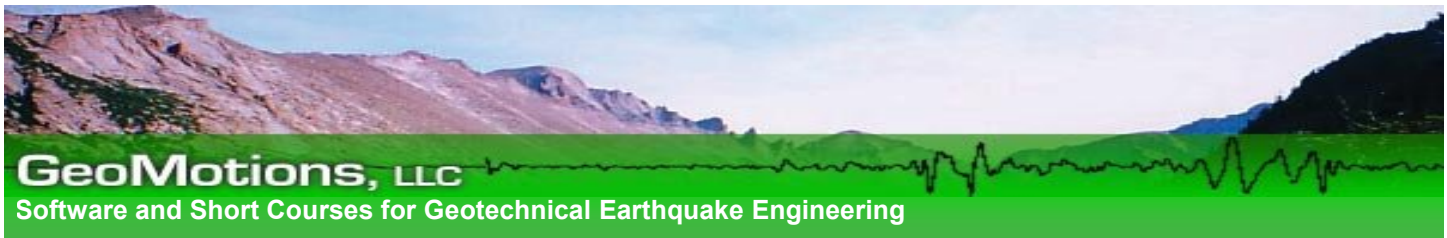
- Site Conditions
- Selection of Ground Motion: Target Response Spectrum & Ground Motion Time History
- Site Response Analysis

**Lunch 12:00**

**5. Site Response Analysis - SHAKE2000 Hands-on Training 1:00**

- 1-D Equivalent Linear Analysis
- SHAKE & SHAKE2000
- Problem Definition
- Selection of Input Ground Motions
- Dynamic Soil Properties
- Soil Column
- Assignment of Input Motion

**Coffee Break 2:45**



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**6. Site Response Analysis      3:15**  
**SHAKE2000 Hands-on**  
**Training (cont.)**

- Acceleration & Shear Stress Time Histories
- Response Spectrum
- Multiple Analyses
- Newmark-Type Analysis

- 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)

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

**7. Questions/Answers      4:45**

**Coffee Break      2:30**

**Saturday, May 9**

**8. Role of Advanced      8:00**  
**Analyses in Geotechnical**  
**Earthquake Engineering**

- Basic Definitions
- Why and When is Nonlinear Analysis required?
- Why and when is Effective-Stress Analysis required?
- What are the limitations of 1-D Nonlinear (and Effective-Stress) Models?
- When are 2-D and 3-D Analyses required?
- When Soil-Structure Interaction Effects should not be ignored?
- Discussion and Recapitulation

**Lunch      12:00**

**10. 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 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

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

- Program Installation
- Problem Definition and Input Data
  - Problem Definition
  - How to Import SHAKE2000 Input Data into D-MOD2000
  - Analysis Control Data
  - Soil Column
  - Selection of Input Ground Motions
  - Dynamic Soil Properties
  - Assignment of Input Motion
- Selection of Target Damping Ratio and Other 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

**Coffee Break      9:45**

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

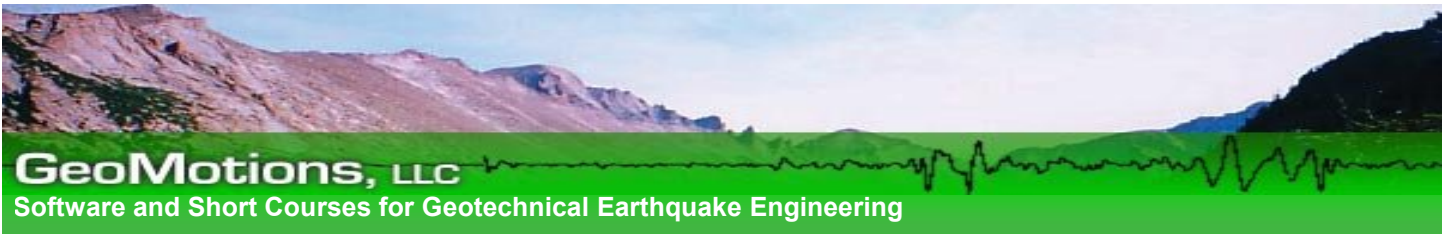
- Total-Stress Analysis
  - Dynamic Response Model
  - Viscous Damping Model
  - Stress-Strain Model

**11. Example Problems      2:00**

- Total-Stress Analysis (Comparison with SHAKE2000)

**Closure      4:45**

- Questions/Answers
- PDH Certificates



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### Participant Contact Information:

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

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

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

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

### Registration Fees (\$850.00 if paid by check; \$925.00 if 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: SC 05/09**  
**3640 Arbor Dr. SE**  
**Lacey, WA 98503**  
**USA**