

Seismic Site Response Analysis with *GeoMotions Suite* Friday, May 18 & Saturday, May 19, 2012 Raleigh, North Carolina

Course Overview

This short course is designed to teach 21st century professionals how to evaluate seismic hazard and perform time history site response analyses using *GeoMotions Suite*. This software suite includes our flagship equivalent-linear and nonlinear effective-stress site response analysis programs SHAKE2000 and D-MOD2000 respectively; and, RspMatchEDT, a pre- & post-processor for RspMatch 2005/2009, a program for generation of spectrum-compatible ground motions. Hands-on training in the use of the *GeoMotions Suite* 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:

- The limitations of various types of site response analyses.
- 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.
- Fundamentals of Newmark-type seismic deformation analysis.

- Soil liquefaction and slope stability analyses using the site response analysis results.
- How to interpret and document the results of nonlinear and effective-stress analyses.
- Calibration of 2D models using D-MOD2000.
- Documentation of results to aid in the regulatory approval of site response and seismic deformation analyses.

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

Course Level

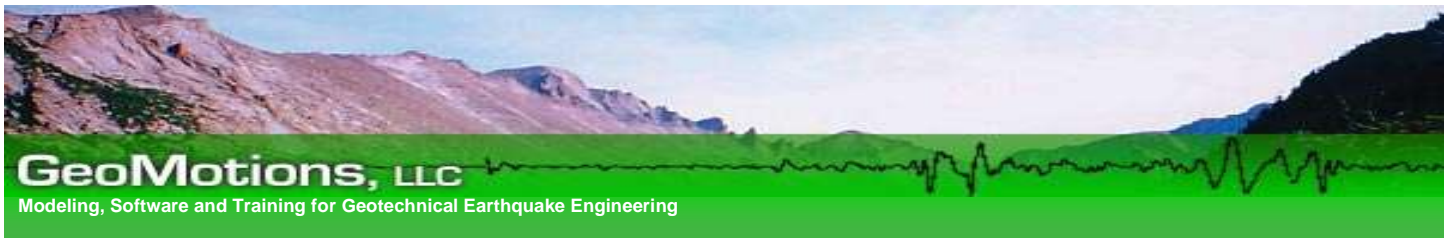
This short course is designed for practicing professionals with formal education in engineering and/or earth sciences.

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 co-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 80 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 20 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 co-developer of D-MOD2000; and, developer of SHAKE2000 and RspMatchEDT.

Invited Speaker: Adrian Rodriguez-Marek, Ph.D., is an associate professor at Virginia Tech where he teaches graduate courses in Geotechnical Earthquake Engineering and Risk and Reliability Analysis. He obtained his doctorate from the University of California at Berkeley in 2000 and joined the faculty at Washington State University before joining Virginia Tech in 2010. His research focuses on various areas of geotechnical earthquake engineering, including site response, ground motion characterization, and stochastic response of geotechnical systems. His consulting work includes service as a resource expert and technical integrator in seismic hazard assessment projects for nuclear power plants in Switzerland and South Africa. He also led three NSF-sponsored earthquake reconnaissance missions to earthquakes in Peru and Mexico.



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Registration Information

- Advance registration and payment are required. Registration will be on a first-come/first-served basis. Space is limited to 20 participants. A limited number of seats are reserved for registered users.
- **One full license of the software suite, one USB hardware key, and technical support are included with the full registration fee.**
- The registration fee is \$1,100.00 USD.
- If you are a registered user of SHAKE2000, D-MOD2000 or RspMatchEDT, you can receive a discount if you wish to upgrade to the Suite. A new USB key is not included with the reduced registration fee. Please contact us for more information.
- Cancellations accepted and partial refunds provided on/or before April 30, 2012. 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.

- The short course will be held at:

Embassy Suites
Raleigh-Durham Airport
8001 Arco Corporate Dr.
Raleigh, NC 27617

Tel: (919) 572-2200

- A block of rooms has been set aside at the group room rate of \$119.00 plus tax per night. Call before the cutoff date of April 26, 2012 to assure availability. Mention the **GEO** group code when making your reservation.
- **Short course participants are required to bring their own laptops. Current users, please bring your USB hardware key.**
- 1.6 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) 491-5397**
 (GMT -08:00 - Pacific Time USA)

E-mail: **training@geomotions.com**

Agenda Friday, May 18th

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| Registration | 7:30 |
| 1. Introduction and Objectives | 8:15 |
| 2. Seismic Hazard Parameters and Development of Design Ground Motions | 8:30 |
| <ul style="list-style-type: none"> • Introduction and Basic Definitions | |

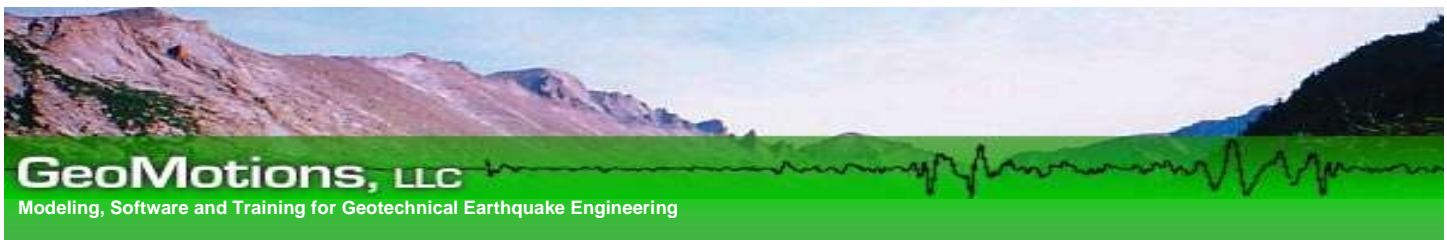
Coffee Break 9:45

3. Equivalent Linear Analysis 10:00 and Dynamic Soil Properties

- Site Characterization
- Representative Soil Profile for Site Response Analysis
- Soil and Bedrock Parameters for Site Response Analysis including Shear Wave Velocity and Unit Weight Profiles, Modulus Reduction and Damping Curves
- Sensitivity of Site Response Analysis to Input Parameters
- Example Problem – Turkey Flat Site Response Case History
- Discussion/Questions

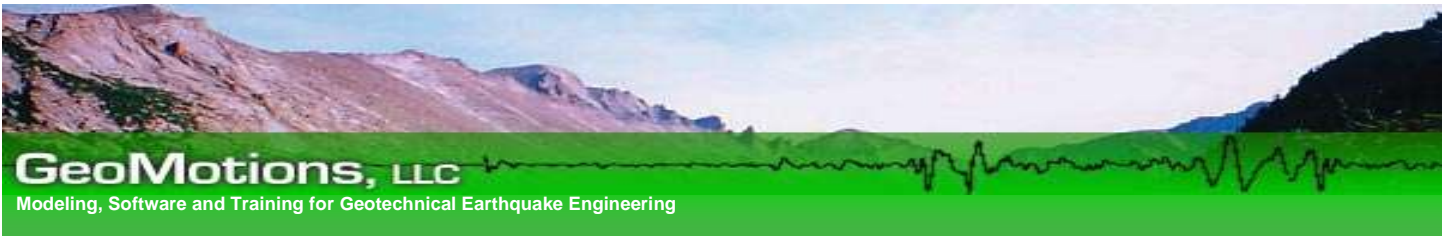
4. Probabilistic Seismic Hazard Analysis 11:00

- Introduction to PSHA:
 - Earthquake Sources – CEUS Seismicity
 - Magnitude and Source-to-Site Distance Distribution
 - Distribution of Ground Motion Intensity
 - Probabilistic Calculations
- Deaggregation of Hazard
- PSHA and the Building Code
- Deterministic vs. Probabilistic



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|--|--------------|---|--------------|--|
| Lunch (on your own) | 12:00 | | | |
| 5. Site Response Analysis (SHAKE2000) Hands-on Training | 1:00 | | | |
| <ul style="list-style-type: none"> • Software Features • Training Objectives & Outline • 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, May 19th | | | | |
| 7. Role of Advanced Analyses in Geotechnical Earthquake Engineering | 8:00 | | | |
| <ul style="list-style-type: none"> • 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 | 10:00 | |
| | | <ul style="list-style-type: none"> • Total-Stress Analysis <ul style="list-style-type: none"> ○ 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 | |
| | | <ul style="list-style-type: none"> • Layer Thickness • Transmitting vs. Rigid Boundary • Evaluation of Rayleigh Damping Model Parameters • Use of Generic Model Parameters • Generation of Nonlinear Model Parameters from Published Data and from Laboratory Testing Results • Interpretation of D-MOD2000 Output • Modeling Tips • “Independent” Validation of D-MOD2000 | | |
| | | 10. D-MOD2000 Hands-on Training | 2:00 | |
| | | <ul style="list-style-type: none"> • Problem Definition <ul style="list-style-type: none"> ○ Import SHAKE2000 Input Data into D-MOD2000 ○ Nonlinear Model Building ○ Assignment of Input Ground Motions ○ Dynamic Soil Properties and Model Parameters ○ Analysis Control (Total-Stress/Effective Stress) | | |
| | | Coffee Break | 3:00 | |
| | | D-MOD2000 Hands-on Training (cont.) | 3:15 | |
| | | <ul style="list-style-type: none"> • Rayleigh Damping Parameters • Site Specific Response Analysis with D-MOD2000 <ul style="list-style-type: none"> ○ Acceleration and Shear Stress Time Histories ○ Tracing of Stress-Strain Time History ○ PWP Time Histories ○ Response Spectra ○ Plotting & Reporting | | |
| | | 11. Example Problems | 4:30 | |
| | | <ul style="list-style-type: none"> • 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 | | |
| | | Closure | 5:00 | |
| | | <ul style="list-style-type: none"> • 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: Fee \$1,100.00 USD

| | Name of Attendee | E-mail | Fee |
|----|------------------|--------|----------|
| 1. | _____ | _____ | \$ _____ |
| 2. | _____ | _____ | \$ _____ |
| 3. | _____ | _____ | \$ _____ |
| | | Total: | \$ _____ |

Payment Information:

Please contact us at (360) 491-5397 or training@geomotions.com if you would like to obtain additional information.

To register online and pay with a credit card or PayPal, please visit our web site at www.geomotions.com and follow the "Short Courses" link.

To pay by check, please make check payable to "**GeoMotions, LLC**" and mail this form with payment to:

GeoMotions, LLC
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Lacey, WA 98503
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