

# NORTHEASTERN UNIVERSITY

## Department of Civil and Environmental Engineering College of Engineering Distinguished Seminar

### End-to-End Earthquake Simulation: From the Source to Propagation Path, Site Effects, and Seismic Response of Building Clusters

Thursday, November 14, 2013  
105 Shillman Hall  
3:00 p.m.

#### Prof. Jacobo Bielak

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Department of Civil and Environmental Engineering  
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**Abstract:** This talk will address the response of a simple class of building clusters during earthquakes, their effect on the ground motion, and how individual buildings within the cluster interact with the soil and with each other. In order to study this problem it is convenient to first simulate the free-field earthquake ground motion and then incorporate this ground motion as input to the domain that includes the building structures. To this effect, I will describe Hercules, a parallel octree-based finite element code developed by the Quake Group at CMU for modeling the kinematic source, wave propagation path and local site effects, and the Domain Reduction Method (DRM), our methodology for incorporating the incoming seismic motion into the analysis of the earthquake response of civil infrastructure in a localized region. As an application, I will then show results of a simulation of the ground motion during the 1994 Northridge earthquake and focus on the coupled response of a set of idealized building models located within the San Fernando and Simi Valleys in southern California.

**Bio:** Jacobo Bielak received his Civil Engineer's degree from the National University of Mexico (UNAM), M.S. from Rice University, and Ph.D. from Caltech. He joined Carnegie Mellon University in 1978, where he is now the Paul Christiano University Professor. His research is in the area of computational mechanics with special emphasis on earthquake engineering and engineering seismology. The main objective of his research is to contribute to the understanding of earthquake-related phenomena, in an end-to-end approach, with the ultimate goal of mitigating the impact that earthquake events can have on complex infrastructure systems. He was a member of the original Applied Technology Council (ATC) committee that drafted the first tentative seismic provisions for soil-structure interaction in the U.S. based mainly on his work. These provisions are now, in modified form, part of the NEHRP seismic provisions. Recognition for his work includes the Gordon Bell Prize for Special Accomplishment Based on Innovation. He is a member of the Mexican Academy of Engineering, the Mexican Academy of Sciences, a Fellow of the U.S. Association for Computational Mechanics, a Distinguished Member of ASCE, and a member of the U.S. National Academy of Engineering.

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Reception to follow  
4:00 p.m. – 5:00 p.m.  
4<sup>th</sup> Floor Lobby  
Snell Engineering Center

