Two Open Graduate Research Assistantships

Usama El Shamy (Environmental and Civil Engineering Department) and Paul Krueger (Mechanical Engineering Department) at Southern Methodist University in Dallas, Texas, USA announce two open Graduate Research Assistantships for their project entitled “Multiscale experimental and computational investigations of erosion-induced failure of levee systems” and recently funded by the National Science Foundation. The activities of this interdisciplinary research effort are centered around providing an experimentally validated, and thus predictive, computational research tool for the analysis and design of geotechnical systems subjected to extreme loading conditions and exploring the complex response of flood-induced failure of levee systems under representative flooding scenarios. The research includes a computational component, supervised by Prof. El Shamy, and an experimental component, supervised by Prof. Krueger. One GRA opening is available for each component, brief descriptions of which are given below.

Computational Component (Prof. El Shamy): A multi-scale computational approach that combines the best features of continuum-based techniques and microscale models will be developed to simulate the soil-fluid-structure system that represents a levee in a general way. The objective of the computational work is to capture, with minimal empirical tuning, the effects of surface waves and deformation of the floodwall, the possible separation between of the floodwall and from the soil as floodwater rises and the impact of such separation on the distribution of water pressure surrounding the wall as well as possible occurrence of piping and scour in the soil media in the neighborhood of the floodwall. The project requires a student with a strong background in programming (preferably using C++) and is familiar with computational modeling tools such the finite element method, DEM, and CFD.

Experimental Component (Prof. Krueger): The novel experimental program will quantitatively investigate the interaction between a fluid and embedded particles in shear and unsteady flows. Using transparent particles embedded in a matched-index-of-refraction fluid, the combined motion of the fluid and densely-packed particles will, for the first time, be measured using a combination of digital particle image velocimetry (DPIV) and direct imaging of the embedded particles. The experimental results will serve to construct a model for the lift force on particles – which is necessary for accurate simulations of scour and erosion. Additionally, experiments of simplified model levee systems will be used to validate the computational method. Prior experience with DPIV is not a requirement for this project, but experience with DPIV and image processing will be evaluated positively. Interested students must have some computer programming experience, preferably in Matlab.

The GRA positions will be for 2.5 years, beginning fall of 2010. The positions include a tuition waiver and a monthly stipend of $1650. Students who have completed a Masters degree are preferred, but exceptional students who have completed a Bachelors degree and have experience related to the research will also be considered. Commensurate with the expectations of a PhD degree, the students will be expected to work as a teaching assistant in departmental laboratory courses for two semesters during the research project to assist in the development of teaching and communication skills. Candidates interested in either component should send a detailed résumé and one-page statement of interest to the appropriate supervisor. To meet deadlines for the fall semester, candidates should send information as soon as possible. The contact information for the project supervisors is given below:

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