

**Special Guest Lecture by:**  
Mr. Kallol Sett  
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Wednesday, April 12, 2006  
Location: Mason Building, Room 142-A  
3:00 to 4:00 p.m.

**TOPIC:**  
"Modeling and Simulation of Stochastic Elastic-Plastic Materials"

**ABSTRACT:**  
The elastic-plastic theory is fairly well developed for metals and to a lesser extent for geomaterials. Geomaterials are particularly hard to model and simulate due to their inherent natural variabilities and other uncertainties arising from testing and transformation errors. These result in uncertainties in behaviors of solid and structures made with geomaterials. In elastic-plastic modeling, the material models are calibrated against experimental results. The measurements generally obey some probabilistic distributions but usually only the mean values are used for further deterministic modeling and simulations. Thus the uncertainties in material properties are lost in the simulation results.

This presentation deals with a new approach to account for uncertainties in elasticplastic material simulation. The methodology, based on stochastic differential equation approach, results in a Fokker-Planck-Kolmogorov (FPK) equation corresponding to the elastic-plastic constitutive equation. The advantage of the FPK equation is evident as it transforms the original non-linear stochastic ordinary differential equation to a linear deterministic partial differential equation. The developed methodology is capable of providing complete probabilistic description (probability density function) of the response. The development is general in nature and applicable to any incremental elasticplastic material model and any probabilistic distribution of material property. Number of examples will be presented, nicely illustrating the methodology and main findings.