



**You are cordially invited to attend the following seminar sponsored by
the Department of Mechanical Engineering:**

**Friday, November 30, 2007
114 Spencer Lab, 12:15 – 1:15 P.M.**

*Dr. Nabil Simaan
Columbia University*

“Robotic Assistance in Deep Surgical Fields”

Abstract:

During the last decade, medical robotics proved its efficacy in extending the capabilities of surgeons through seamless coupling of information with intra-operative action. Using robotic assistance, surgeons were able to successfully overcome the constraints of Minimally Invasive Surgery (MIS) for applications such as abdominal laparoscopic surgery, cardiac surgery, and prostatectomy. Despite these successes, the current robotic systems are limited in their applicability to surgeries on organs located in deep surgical fields such as the throat and the inner ear.

This seminar will present the speaker’s ongoing research on robotic systems that serve as enablers for currently inoperable surgical procedures by using current robotic systems. The ongoing work on flexible snake-like robots for MIS of the throat, flexible under-actuated robots for cochlear-implant surgery, and dual-arm parallel robots for dexterous intra-ocular retinal surgery will be highlighted with focus on both the expected clinical impact and the theoretical research problems associated with these robotic systems.

The talk will focus on identifying the clinical motivation behind each of these applications and then outlining the research interest behind each problem. The analysis and modeling challenges related to each one of these robotic systems will be highlighted. A new approach to estimation of the forces of interaction with the anatomy will be presented. This approach is based on the application of screw theory for flexible snake-like devices. The problem of dexterity evaluation for dual arm systems operating inside a hollow organ will be addressed and a unified modeling approach that allows quantifying the importance of intra-ocular surgery will be presented.

Refreshments will be served