

Date: **Thursday, February 2, 2012, 12:00-12:50pm**

Location: **Hackerman Hall B-17**

Speaker: **Dr. Yuhang Chen**, Visiting Scholar  
University of Sydney, Australia  
Centre for Advanced Materials Technology



## Microstructural Design of Porous Biomaterials – Applications of Topology Optimization in Biomedical Engineering

This talk will provide an overview of our recent developments in design of porous biomaterials in biomedical engineering. Computational design and microstructural optimization of porous biomaterials will be presented using topology optimization and other mathematical approaches. Such computational approaches are drawing increasing attention in order to enable the ‘engineering *design* and *optimization*’ for biomedical devices. Tissue scaffolds, which have been developed as the main therapeutic means for tissue regeneration, and their microstructures are designed and optimized based on key principles in tissue engineering, including stiffness, permeability and uniformity of wall shear stress requirements. Additionally, the micromechanical environment within scaffolds has been explored with the goal properly accounting and optimizing for polymer hydrolysis and cellular mechanobiological behaviors. Topology optimization can further be used to determine the critical size of polymer erosion at which the acid-free micro-chemical environment can be achieved in biodegradable drug delivery systems. Additional applications in biomedical engineering, including optimal design of drug-eluting stent structures that have less dog-boning effect and contact pressure against vascular walls when deploying, will also be discussed.

### About the Speaker

Dr. Yuhang Chen is a Postdoctoral Research Fellow at the University of Sydney (USYD), Australia, and will join Heriot-Watt University in Edinburgh, UK as a Lecturer (Level B) in March 2012. He received a B. Eng. degree in Mechanics (2007) from Tongji University, China, and a Ph.D. in topology optimization of microstructural biomaterials in tissue engineering from USYD (2011). His research mainly focuses on the computational design and microstructural optimization of porous biomaterials, such as tissue scaffolds, vascular stents and drug delivery systems, using topology optimization and other mathematical approaches. At present he is the Visiting Scholar spending one month in Department of Civil Engineering in the Whiting School of Engineering at the Johns Hopkins University, supported by USYD Deputy Vice-Chancellor-International (DVC-I) International Program Development Fund (IPDF).