Departament d'Enginyeria Electrònica
UNIVERSITAT POLITÈCNICA DE CATALUNYA

UPC Dpt. ELECTRONICS ENGINEERING Doctoral Program: Invited Talk

When: ***Tuesday, October 16th 2012***
12:00

Where: ***AULA CAPELLA (ETSEIB)***
Diagonal, 647 Ground Floor
08028 BARCELONA

Title:

Automated Design of Digital Microfluidic Lab-on-Chip: Connecting Biochemistry to Information Technology and Electronic Design Automation

Speaker: **Prof. Krishnendu Chakrabarty**
Department of Electrical and Computer Engineering
Duke University *Durham, NC 27708 U.S.A.*

Abstract Microfluidics-based biochips (or lab-on-chip) are revolutionizing laboratory procedures in molecular biology, and leading to a convergence of information technology with biochemistry and microelectronics. Advances in microfluidics technology offer exciting possibilities for high-throughput DNA sequencing, protein crystallization, drug discovery, immunoassays, neo-natal and point-of-care clinical diagnostics, etc. As microfluidic lab-on-chip mature into multifunctional devices with "smart" reconfiguration and adaptation capabilities, automated design and ease of use become extremely important. Computer-aided design (CAD) tools are needed to allow designers and users to harness the new technology that is rapidly emerging for integrated biofluidics.

This talk will present ongoing work on design and test techniques for microfluidic biochips. First, the speaker will provide an overview of electrowetting-based digital microfluidic biochips. Next, the speaker will describe synthesis tools that can map behavioral descriptions to a reconfigurable microfluidic device and generate an optimized schedule of bioassay operations, the binding of assay operations to functional units, and the layout and droplet flow-paths for the biochip. Techniques for pin-constrained chip design, fault detection, and dynamic reconfiguration will also be presented. An automated design flow allows the biochip user to concentrate on the development of nano- and micro-scale bioassays, leaving implementation details to CAD tools.

Professor Krishnendu (Krish) Chakrabarty

Department of Electrical and Computer Engineering Duke University

Krish Chakrabarty has been at Duke University since 1998. His current research is focused on: testing and design-for-testability of integrated circuits (especially 3D and multicore chips); digital microfluidics, biochips, and cyberphysical systems; optimization of digital print and production system infrastructure. His research projects in the recent past have also included chip cooling using digital microfluidics, wireless sensor networks, and real-time embedded systems.

He holds a US patent on built-in self-test, and has a pending US patent on digital microfluidics. He serves as Editor-in-Chief of *IEEE Design & Test of Computers*, and as Editor-in-Chief of *ACM Journal on Emerging Technologies in Computing Systems*. He is an Editor of the *Journal of Electronic Testing: Theory and Applications (JETTA)*, and an Associate Editor of *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems*, *IEEE Transactions on Biomedical Circuits and Systems*, and *IEEE Transactions on Circuits and Systems II*. He served as an Associate Editor of *IEEE Transactions on Circuits and Systems I* during 2006-2007, and as an Associate Editor of *IEEE Transactions on VLSI Systems* during 2005-2009.

Prof. Chakrabarty is a Fellow of IEEE, a Golden Core Member of the IEEE Computer Society, a Distinguished Engineer of ACM, and a member of SIGDA. He is also an Invitational Fellow of the Japan Society for the Promotion of Science (JSPS), 2009. He is a recipient of the IEEE Computer Society Meritorious Service Award. Prof. Chakrabarty is a Chair Professor (Member of the Chair Professor Group in Software Theory) in the School of Software in Tsinghua University, Beijing, China, and a Visiting Chair Professor in Computer Science and Information Engineering at National Cheng Kung University in Taiwan.