Abstract:
Micro- and nanofabrication technology can be considered to be a manufacturing technology that exploits the fabrication techniques typically used to create integrated circuits, augmented by some specialized tools, to also create structures and devices with enabling features on the nano to micro scale. Examples include the top-down engineering of materials with specific desirable properties; mechanical structures with appropriate shapes and sizes to interface with larger systems of interest; and small-scale transducers such as microsensors and microactuators. The available materials set is not limited to those of integrated circuits, but also includes metals, polymers, ceramics, and natural materials. Materials, devices and systems produced by these manufacturing technologies have the capability for small size, high functionality (as well as spatial co-location of functionality), and batch fabrication manufacturing economics.

The utility of micro- and nanofabrication technology will be illustrated through discussion of three research projects in our laboratory that span three areas of specialization. The first involves the realization of ultracompact electrical energy conversion, where the nanostructuring of thick (0.1-1 mm) metallic materials enables eddy current losses in metallic magnetic alloys to be almost completely suppressed. The second involves the engineering of biological interfaces, including flexible neural probes as well as the formation of all-protein biological tissue constructs for blood vessel repair. The third involves the design, implantation, and performance of wireless implantable pressure sensors for medical applications.

About Mark Allen:
Dr. Mark G. Allen received the B.A. degree in Chemistry, the B.S.E. degree in Chemical Engineering, and the B.S.E. degree in Electrical Engineering from the University of Pennsylvania, and the S.M. and Ph.D. from the Massachusetts Institute of Technology. In 1989 he joined the faculty of the School of Electrical and Computer Engineering of the Georgia Institute of Technology, where he currently holds the rank of Regents' Professor and the J.M. Pettit Professorship in Microelectronics, as well as a joint appointment in the School of Chemical and Biomolecular Engineering. His current research interests are in the field of microfabrication and nanofabrication technology, with emphasis on new approaches to fabricate devices with characteristic lengths in the micro- to nanoscale from both silicon and non-silicon materials. Professor Allen was the co-chair of the 1996 IEEE/ASME Microelectromechanical Systems Conference, is currently Editor-in-Chief of the Journal of Micromechanics and Microengineering, will co-chair the 2012 Power MEMS conference, and is a member of the MIT Corporation Visiting Committee for Sponsored Research. He has also held several visiting professorships at the Swiss Federal Institute of Technology (ETH-Zürich). He is co-founder of several microfabrication-oriented companies, including CardioMEMS (www.cardiomems.com) and Axion Biosystems (www.axionbio.com). He is a Fellow of the IEEE.

In addition to his faculty duties, from 2007-2010 Professor Allen held the position of Senior Vice Provost for Research and Innovation at Georgia Tech. In that capacity he was charged with overseeing Georgia Tech's interdisciplinary research centers, managing Georgia Tech's $500 million sponsored research portfolio, and guiding the commercialization of Georgia Tech research results and intellectual property. In 2011, he accepted the position of Executive Director of the Institute for Electronics and Nanotechnology (IEN) at Georgia Tech, a concatenation of research centers in the areas of electronics and nanotechnology. IEN is charged with providing intellectual leadership in electronics and nanotechnology research, as well as formulating the strategic focus for, and maintaining, Georgia Tech’s $100M+ facilities infrastructure investments that enable research efforts in this area.