

Course 103: Surface Micro-Fabrication and Foundry Fabrication Processes

Sunday, June 3 | 1–5:00 p.m.

Course Description

This course covers a brief history, design and fundamentals of Integrated Circuits (IC) and microelectromechanical systems (MEMS) fabrication. Typical fabrication methods covered include surface micromachining, bulk micromachining, and micromolding. A broad range of MEMS transducers (sensors and/or actuators) and applications will be surveyed. This course will include a discussion of commercially available foundry fabrication options, highlighting some of the general benefits and limitations of these processes and an in-depth look into a commercial polycrystalline (POLY) silicon surface micromachining process, The Multi-User MEMS Processes (MUMPs®),” by MEMSCAP. This course will conclude with set-by-set example of how one would layout a design, using the computer aided drawing program “L-Edit”, for fabrication using MEMSCAP’s POLYMUMPs process.

Outline

- A brief history, design and fundamentals of Integrated Circuits (IC) and microelectromechanical systems (MEMS) fabrication.
- Typical fabrication methods covered include surface micromachining, bulk micromachining, and micromolding.
- A discussion of commercially available foundry fabrication options, highlighting some of the general benefits and limitations of these processes. (SUMMIT and multiple MEMSCAP Processes)
- An in-depth look into a commercial polycrystalline (POLY) silicon surface micromachining process, The Multi-User MEMS Processes (MUMPs®),” by MEMSCAP.
- Tutorial Format: A set-by-set example of how one would layout a design, using the computer aided drawing program “L-Edit”, for fabrication using MEMSCAP’s POLYMUMPs process. (Briefing slides as Backup)

Who Should Attend

Individuals with little to no microfabrication experience who would like a foundational understanding of fabrication techniques and how they could get devices fabricated quickly and relatively inexpensively, through commercial fabrication, to enable their research.

Course Fee

The regular fee is \$500 and the student fee is \$250. Course fee includes course handout material and refreshment breaks. Lodging, additional food and other materials are not included.

Cancellation Liability

If the course is cancelled for any reason, the Society for Experimental Mechanics’ liability is limited to the return of the course fees.

Instructor

John P.K. Walton— *Air Force Research Laboratory*

John P.K. Walton is currently the Deputy Chief of the Integration and Operations Division at the Air Force Research Laboratory’s Sensors Directorate. He received his B.S. in Computer Engineering from the University of Arizona in 2008, his M.S. in Electrical Engineering from the Air Force Institute of Technology (AFIT) in 2015, and is currently working on his PhD in Electrical Engineering with a dissertation research focus on microelectromechanical system (MEMS) energy harvesting. His current research interests are MEMS based sensors and actuators, energy harvesting, optical beamsteering, and other devices.



John P.K. Walton

Dr. LaVern Starman— *Air Force Research Laboratory*

Dr. LaVern Starman is currently the lead engineer in the optical MEMS beamsteering group at AFRL in the Highly Integrated Microsystems Branch at Wright-Patterson AFB. He received his B.S. from the University of Nebraska in 1994, his M.S. from Wright State University in 1997 and his PhD from AFIT in 2002, all in Electrical Engineering where his dissertation research focused on stress characterization in MEMS using Micro Raman Spectroscopy. Dr. Starman’s current research focus areas include material stress characterization, optical beamsteering, and MEMS based sensors & actuators. He is a member of IEEE, Tau Beta Pi, and Eta Kappa Nu.



Dr. LaVern Starman

Tod V. Laurvick— *Air Force Institute of Technology*

Tod V. Laurvick is an Assistant Professor of Electrical Engineering at the Air Force Institute of Technology (AFIT). He received his B.S. in electrical engineering from Michigan Technological University (MTU) in 1995 and his M.S. and PhD in electrical engineering from AFIT in 2009 and 2013. His Air Force assignments include both the Airborne Laser Program and Starfire Optical range. Prior to receiving his commission, he has over eight years of industry experience in research and development, manufacturing, and optimization of factory automation for multiple industries. His current research interests are applications of advanced fabrication techniques applied to the study of micro-electrical contacts and other devices..



Tod V. Laurvick