
Objective: To provide a detailed look into the various planar and non-planar fabrication methods employed for MEMS device design. To provide an in-depth look at the various methods and techniques employed for microfluidic actuation and control and its applications.

Instructor: Ravi Selvaganapathy, ETB 406, ext. 27435, selvaga@mcmaster.ca
Term: Winter
Text: None (course notes and research articles provided by the instructor will be used)

Supplementary Materials and References: Research articles provided by instructor
References – Books (several of these books are course reserves and can be accessed through Thode library)

Microfluidics:
Design:

Microfabrication:

Grading Scheme: Class Presentation: 40%, Assignments: 30%, Final Project 30%

Course Contents:
1) **Introduction** to MEMS and Microfabrication

2) **Conventional Microfabrication**: Silicon based: Surface Micromachining, Bulk Micromachining, Glass Micromachining

3) **Non-conventional Microfabrication**: Electro discharge machining, Laser Micromachining, LIGA, Microstamping and soft lithography, Stereo lithography, Focused Ion Beam machining

4) **Microfluidics**:
   *Microchannels*: Flow in Microchannels, Fabrication methods.


   **Microvalves**: Passive Valves: Structural design. Active valves: Piezoelectric, Bimorph, Thermo pneumatic, Large scale integration, Thermal and pH responsive.

   **Micropumps**: Micro-displacement pumps, Electric-field assisted pumps, Magnetohydrodynamic pumps, Acoustic streaming (ultrasonic) pumps, Pumping based on interfacial tension, Rectified pumping, Knudsen pump.

   **Droplet motion**: Electrowetting, Dielectrophoresis, Traveling wave methods, Droplet generation.

5) **Integrated Microsystems** for biological applications: Lab on chip systems, Polymerase chain reaction microchips, Immunoassay microchips, Massively parallel nucleic acid construction, DNA sequencing chips, Microfluidic interface for Mass spectroscopy, Microfluidic cell handling