Registration for our annual, one-week summer course, “Introduction to Microfluidics Technology” at Brandeis University, near Boston, MA, is now open.

Introduction to Microfluidics Technology is a hands-on laboratory course sponsored by the National Science Foundation’s Bioinspired Soft Materials Research Science and Engineering Center (MRSEC) at Brandeis. It will be offered during the week of June 25 - 29, 2018. The course is intended for graduate students, post-docs, faculty, and industrial scientists/engineers interested in utilizing microfluidic technology in their work, both in the physical and life sciences.

The $900 fee covers course tuition, housing in double-occupancy rooms, and breakfast/lunch/coffee from Monday through Friday. Single rooms are not available. Local students who do not need housing will pay a reduced fee of $700.

Registration closes March 31, 2018. See the course syllabus for a detailed description. Applications will be reviewed on a rolling basis, and suitable students will be admitted as selected throughout the months of March and April. Further information for those admitted will be provided. If you have questions before applying, please email Mike Norton (mmnorton@brandeis.edu).

Application Instructions

To apply, please email Mike Norton (mmnorton@brandeis.edu) by March 31, 2018, with all of following materials attached in one email. Please write “MRSEC Summer Course Application” in the subject line.

- Name and gender (for housing)
- Housing needs (option 1: shared occupancy room, option 2: no-housing needed)
- Current CV
- Field of research
- Research advisor name (if applicable)
- A short paragraph explaining how your research work will benefit from this course including how you wish to use microfluidics in the future.
- A short paragraph describing your expectations of the course including what knowledge and devices you hope to take home with you
- In addition, if you are a student or postdoctoral fellow, please have your research advisor write an email in support of your application from his/her university account. This email need only state that she/he approves of your attendance.

Payment Information

To pay by check, please make it payable to and mail to: Brandeis University, Attn: Physics Department MS 057, 415 South St, Waltham, MA 02453.

To pay by credit card please follow the link: https://bran-internet.choicecrm.net/templates/BRAN/?cts_legacy_app, and select either MRSEC Summer: Microfluidics-Non-Residence ($900) or MRSEC Summer: Microfluidics Residence ($700).
Introduction to Microfluidics Technology Syllabus
June 25-29, 2018, Abelson 229, 9:00 a.m. - 5:00 p.m

Program Administrator:
Dr. Anique Olivier-Mason Abelson 216 781-736-2838 aniqueom@brandeis.edu

Instructors:
Dr. Michael M. Norton Abelson 210 781-736-2885 mmnorton@brandeis.edu
Ali Aghvami Abelson 210 aghvami@brandeis.edu
Marilena Moustaka Abelson 210 mmoustak@brandeis.edu

Course Overview
This course will introduce participants to microfabrication technologies available for building microfluidic devices. We developed this course in response to interest in microfluidics from industry, government, and academia. Over five sessions, we will emphasize hands-on and independent experimentation on microfluidic systems. We will motivate the design of devices by covering basics of laminar flow, surface tension, wetting phenomena, and molecular diffusion.

By the end of the course, students will be able to apply their knowledge to design and build microfluidic devices for their own research projects. All attendees will have individual consultations with experts in the field and leave with a prototype device of their own design. Participants are expected to possess a background in quantitative science. Experience working in a chemistry wet lab is preferable but not essential.

Preparation
Before the course, students should:

- Have AutoCAD installed on their computer and be able to create basic shapes (i.e. a circle or rectangle). There is a free student version: http://goo.gl/qc0lxv. Suggested tutorials are:
  - Autodesk: http://goo.gl/8j5v14
- Complete the required Brandeis University Chemical Hygiene safety training online (http://brandeis.traincaster.com/app/Login.pm). This must be done before the second day of the course.

Attendance
In order to successfully complete the course and earn a certificate of completion, attendance is required for all five days. If an unexpected conflict arises, please contact the instructor.

Suggested Course Reading
- Soft Lithography for Dummies: http://goo.gl/6Qdzmk
- Basic Microfluidic and Soft Lithographic Techniques: http://goo.gl/Le85Wc
- Multi-Height Precision Alignment Techniques: http://goo.gl/3sGuoT
- A Simple and Inexpensive Device to Remove Edge Beads: http://goo.gl/TRrcuu
Course Format
The course will contain lecture, laboratory, and fabrication sessions. During the laboratory and fabrication sessions the students will work in groups rotating through the different fabrication steps and experimental stations.

<table>
<thead>
<tr>
<th>Session</th>
<th>Topics</th>
<th>Intended Learning Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welcome and overview of microfluidics</td>
<td>Introduction to the course and instructional staff. Discussion of the uses of microfluidics in research, introduction to fluid dynamics relevant to microfluidics and descriptions of microfabrication technologies: Soft lithography • Etched/milled chips • Hot embossing • 3D Printing</td>
<td>• Describe the methods of microfluidic fabrication • Restate the steps in different microfluidic fabrication methods • Consider a fabrication method based on the desired usage and functionality</td>
</tr>
<tr>
<td>Lecture 1: Introduction to Microfluidics</td>
<td>Introduction to soft lithography with theory and descriptions of the processing steps: Mask design • Master fabrication (wet &amp; dry resist methods) • PDMS casting • Device finishing</td>
<td>• Explain the process of soft lithography • Differentiate between the two polarities during fabrication • Plan how to make a desired device using soft lithography</td>
</tr>
<tr>
<td>Lecture 2: Introduction to Soft Lithography</td>
<td>Use AutoCAD to design a microfluidic device for their own experiments</td>
<td></td>
</tr>
<tr>
<td>Workshop 1: AutoCAD Design</td>
<td>Introduction to designing soft lithography photomasks using AutoCAD. Use AutoCAD to design a microfluidic device for their own experiments</td>
<td></td>
</tr>
<tr>
<td>Workshop 2: AutoCAD Finishing</td>
<td>Details on finishing a design in AutoCAD and preparing the file to be sent to printing Use AutoCAD to finish a design and send the file to have a photomask printed</td>
<td></td>
</tr>
<tr>
<td>Cleanroom Training</td>
<td>• Introduction to the steps of soft lithography • Create a silicon master using photoresists • Create a PDMS cast of the silicon master • Create a functional device from PDMS casting</td>
<td>• Classify the steps of device fabrication • Construct a finished microfluidic device • Evaluate and critique the design of a novel microfluidic device</td>
</tr>
<tr>
<td>Master Fabrication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PDMS Casting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Device Finishing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Microfluidics Experiments</td>
<td>• Store and create drop generation: create isolated drops of solution within a device • Flow focusing drop generation: create a stable emulsion of drops outside of a device</td>
<td>• Recognize the benefits of experiments using microfluidic devices</td>
</tr>
<tr>
<td>Thermal Press</td>
<td>Introduction to thermal pressing</td>
<td>Describe the process of thermal pressing</td>
</tr>
<tr>
<td>---------------</td>
<td>----------------------------------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td>Design Critique</td>
<td>Q&amp;A Session with the MRSEC Director</td>
<td>Device design critique</td>
</tr>
</tbody>
</table>