Students who are supported by the MBSTP Training Grant are expected to perform the following activities as requirements:

_____ Complete the core course, CHE 696 Microfluidics.

_____ Take one Biology course. The attached list shows classes that are automatically approved. Other classes may be approved by the Executive Committee (E.C.). To obtain approval, make a request by email to Prof. Takayama (takayama@umich.edu) that gives the course number and syllabus or other course description.

_____ Complete an Interdisciplinary research requirement. Students must gain experience working on a project that extends beyond the discipline of their dissertation advisor’s laboratory. This may take the form of a rotation, cross-training in a collaborator’s lab, or industrial internship. Students in Engineering or Physical Sciences are generally expected to work with a biomedical researcher for the interdisciplinary requirement and vice versa. It is expected that the equivalent of six weeks cross-training be met while on the grant. The form of the requirement is flexible, but all students must submit a 0.5 to 1.0 page description of their interdisciplinary plans to Prof. Takayama for approval by the E.C.

_____ Construct a dissertation committee that includes at least one interdisciplinary professor. An engineering student may select someone from the Medical, Life, and/or Health-related Sciences. A physical or biology oriented student may select an engineering professor. This person may also be the collaborator or co-mentor from the interdisciplinary program.

_____ Seminar series: Students are required to attend 80% of the available Microfluidics Seminar series.

_____ Symposium: Students are required to attend the annual Microfluidics in Biomedical Sciences Symposium and participate by presenting a poster.

_____ Participate in a monthly Journal Club led by a Microfluidics Training Program Faculty.

_____ Complete a Workshop on Rapid Prototyping of Microfluidic Devices sponsored by the Training Grant. (Not required if already experienced in microfab).

_____ Complete Ethics in Research course. Previously, this involved using PEERS system. It is now required that students take PIBS 503.

_____ Dissertation research should show evidence of using Microfluidics in Biomedical Sciences.

_____ When requested, enter information on M-TRAIN and X-TRAIN.

_____ Attend NIBIB meeting.
Approved Biology Courses:

- **415 Introductory Biochemistry**
  Prerequisite: Two Terms of Organic Chemistry equivalent to Chem. 225 and 226. No credit to those who have completed or are enrolled in Biology 411.

- **Biology 525/526 - Chemical Biology I & II**

- **Biology 427 - Molecular Biology**
  Prerequisite: Biology 305; Biology 310, 311; BioChem. 415 or Chem. 451; or Graduate Standing.

- **Biology 428 - Cell Biology**

- **Biological Chemistry 578 - Biochemical Techniques**

- **CDB 530 Cell Molecular Biology**

**RECOMMENDATIONS**

Beside the requirements, we highly recommend the following:

- Take an elective course from the attached list.

- Take either ES 715 - Innovative New Business Design course, industry track, or Pharm 502 - Grant Writing, academic track.

- Participate as an officer in the Microfluidics Seminar and Workshop series.

**I. Course Electives**

Taking at least one of the following courses is recommended, but not required:

**Chemical Engineering Courses:**

- **444 - Applied Chemical Kinetics**
- **527 - Fluid Flow**
  Prerequisite: ChemE 341
- **543 Advanced Separations Processes**
  Prerequisite: ChemE 343
  Additional ChE Courses (currently listed as ChE 696):
  - Biomolecular Engineering, Instructor: Joerg Lahann
  - Nana-bio Assemblies, Instructor: Mark Burns, Ron Larson
  - Nanocolloids and Nanomaterials, Instructor: Nick Kotov
  - Molecular Systems Biology, Instructor: Peter Woolf

**Electrical Engineering Courses:**

- **EECS 414 Introduction to MEMS**
- **EECS 423 - Solid –State Device Laboratory**
  Prerequisite: EECS 320 or Graduate Standing
- **EECS 425 - Integrated Microsystems Laboratory**
Prerequisite: EECS 311, or EECS 312, or EECS 414, or Graduate Standing

EECS 528 - Principles of Microelectronics Process Technology
Prerequisite: EECS 421 or EECS 423

EECS 515 - Integrated Microsystems
Prerequisite: EECS 414

Biomedical Engineering Courses:

BiomedE 476 (ME 476) – Biofluid Mechanics
Prerequisite: ME 235, ME 320, and ME 370

BiomedE 479 - Biotransport
Prerequisite: Math 216, ME 330, or permission of instructor

BiomedE 561 - Biological Micro- and Nanotechnology
Prerequisite: Biology 162, Intro Physics and Chemistry, Senior Standing or permission of Instructor.

Mechanical Engineering Courses:

ME 406 – Biomechanics for Engineering Students

ME 476 (BME 476) – Biofluid Mechanics

ME 599 Transport in Microfluidic Systems

Material Science Engineering Courses:

MSE 410 – Biomaterials

MSE 505 – Materials Science of Thin Films

MSE 512 – Polymer Physics

MSE 516 - Mechanics of Thin Films

MSE 583 – Biocompatibility of Materials

Chemistry Courses:

Chemistry 545 – Analytical Chemistry
Prerequisites: Chem 447, 461

Chemistry 646 – Separation Processes
Prerequisites: Che 545 and Graduate Standing

Other courses (please list other courses taken at U of M):

__________________________________________________________________________________________
__________________________________________________________________________________________
__________________________________________________________________________________________
__________________________________________________________________________________________
__________________________________________________________________________________________
II. Required Lab Rotation or Interdisciplinary Collaboration

Lab and Dates of Rotation
________________________________________________________________________________________
________________________________________________________________________________________

Project Thesis
________________________________________________________________________________________
________________________________________________________________________________________

Project Description
________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________

(Separate pages can be attached)

III. Dissertation Committee

Professor __________________________ Department ________________
Professor __________________________ Department ________________
Professor __________________________ Department ________________

IV. Workshops

Rapid Prototyping: This workshop provides hands-on experience in the design and fabrication of a single layer polymer microfluidic device. Over the course of three sessions, participants receive training in device design, use of layout software, lithography, PDSM casting, and device assembly. During the final workshop, participants test the fluidic operation of the devices they have created. Two of the three sessions make use of the clean room facilities available in the Chemical Engineering Department.

Date/Session Workshop completed: _________________

V. Student Events and Participation

a. Microfluidics Seminar Series

Dates attended: ____________________________________________________________

______________________________________________________________
Student/Faculty Meetings, Journal Club

Dates attended: ________________________________________________________________
___________________________________________________________________________

b. MBSTP Annual Symposium

Years attended: ________________________________________________________________
Poster Title(s):
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________

Scientific Meetings/Conferences attended:
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________

d. Published Papers
(Attributed to NIH-MBSTP T32 EB005582 and published full text in PubMed within one year)

Publication details:
___________________________________________________________________________
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