

Mathematical, Computational, and Systems Biology, Ph.D.

The graduate program in Mathematical, Computational, and Systems Biology (MCSB) is designed to meet the interdisciplinary training challenges of modern biology and function in concert with existing departmental programs (Departmental option) or as an individually tailored program (stand-alone option) leading to a Ph.D. degree.

The degree program provides students with both opportunity for rigorous training toward research careers in areas related to systems biology and flexibility through individualized faculty counseling on curricular needs, and access to a diverse group of affiliated faculty and research projects from member departments. Current member departments include Biomedical Engineering, Biological Chemistry, Computer Science, Developmental and Cell Biology, Ecology and Evolutionary Biology, Mathematics, Microbiology and Molecular Genetics, Molecular Biology and Biochemistry, Chemistry, and Physics.

Students interested in the MCSB Program apply to the Office of Graduate Studies (OGS). Applicants must specify that they wish to pursue the M.S. or Ph.D. Upon completion of the M.S., students who may wish to pursue a Ph.D. may request to be evaluated together with the pool of prospective Ph.D. candidates for admission to the Ph.D. program.

Applicants are expected to hold a Bachelor's degree in one of the Science, Technology, Engineering, and Mathematics (STEM) fields. Applicants are evaluated on the basis of their prior academic record and their potential for creative research and teaching, as demonstrated in submitted application materials (official university transcripts, letters of recommendation, GRE scores, and statement of purpose).

Required Core Courses

DEV BIO 203A	Graduate Tutorial in Developmental and Cell Biology
PHYSICS 230A	Biophysics of Molecules and Molecular Machines
DEV BIO 232	Systems Cell and Developmental Biology
ECO EVO 251 or DEV BIO 203C	Evolutionary and Ecological Principles in Medicine Graduate Tutorial in Developmental and Cell Biology
MATH 227A or BME 233	Mathematical and Computational Biology ¹ Dynamic Systems in Biology and Medicine
MATH 227B	Mathematical and Computational Biology
COMPSCI 284C or MATH 227C	Computational Systems Biology Mathematical and Computational Biology

Enrolled students participate in a common first-year "gateway" program and must complete the seven required core courses (listed above). Students are assigned an MCSB Advisory Committee consisting of two participating faculty members to oversee course and laboratory work. Subsequently, students select a thesis advisor and choose between the **Departmental** or **Interdisciplinary** (Stand-Alone) options for the remainder of their Ph.D. training.

Departmental Option

For students who select the Departmental option, a faculty member in a participating department must agree to serve as the student's thesis advisor. Completion of the Ph.D. is subject to the degree requirements of the departmental Ph.D. program in which the student enrolls. Participating departments accept both the course work and research conducted during the "gateway" year in partial fulfillment of such requirements. Students are encouraged to consult with the department of choice for specific information on additional requirements. All department student advisory committees are established according to the rules of the participating department. In addition, the student's MCSB Advisory Committee meets annually to follow progress and provide additional guidance. The normative time to degree for students in the Departmental option is five years.

To complete the coursework requirements for the Departmental option, students must:

- Attend first-year bootcamp
- Perform at least two laboratory rotations; one in an experimental (wet) lab and one in a computational (dry) lab
- Complete the seven required core courses, in addition to any departmental requirements.

Interdisciplinary (Stand-Alone) Option

For students who select the stand-alone option, the student's thesis advisor assumes the role of the Committee Chair when a participating MCSB faculty member agrees to accept that role. Adjustments to the MCSB Advisory Committee may be made based on the area of the student's research, or by request of the student, thesis advisor, or committee members. The student meets biannually with the Advisory Committee until an Advancement to Candidacy Committee has formed, which then assumes the duties until the M.S. or Ph.D. defense. The normative time to degree for students in the Stand-Alone option is five years.

To complete the coursework requirements for the Stand-Alone option, students must:

- Attend first-year bootcamp
- Perform at least two laboratory rotations; one in an experimental (wet) lab and one in a computational (dry) lab
- Complete the seven required core courses, plus five elective courses selected from Breadth Categories I and II.