



Twin Cities Campus

Biochemistry, Molecular Biology and Biophysics M.S.

Biochemistry, Molecular Biology, & Biophysics TCBS

Graduate School

Link to a [list of faculty](#) for this program.

Contact Information:

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- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program requires summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the [General Information](#) section of the catalog website for requirements that apply to all major fields.

The biochemistry, molecular biology and biophysics (BMBB) graduate program is an interdisciplinary program that is supported by the College of Biological Sciences (CBS) and the Medical School of the University of Minnesota. The program provides a broad research-based education involving faculty from BMBB, as well as many faculty members from several other departments in CBS, the Medical School, the College of Science and Engineering (CSE), the College of Food, Agricultural and Natural Resources Sciences (CFANS), and the College of Veterinary Medicine.

BMBB focuses on determining the molecular mechanisms that underlie basic biological functions using an integrated approach that encompasses biochemistry, chemistry, biophysics, genomics, molecular biology, proteomics, and structural biology. Special emphasis is placed on revealing how biological processes go awry in diseases including cancer, diabetes, heart disease, and AIDS. The program has four areas of emphasis: synthetic biology and biotechnology, molecular biology, metabolic and systems biology, and chemical and structural biology. All students are expected to demonstrate a minimum level of competence in these areas, but will emphasize the area most related to their thesis project.

While graduate training in a BMBB laboratory involves first-year coursework and associated preliminary examinations, the focal point for graduate education is thesis research. Laboratory-based exploration coupled with journal clubs, seminars, scientific meetings and retreats, career counseling, and scientific ethics constitutes the major components of the program. Support for graduate education comes from a variety of sources but is augmented by several NIH and NSF-based training grants. Most graduate students from the University of Minnesota obtain full-time employment immediately after graduation or pursue advanced training in academic or corporate positions.

Students pursuing a degree in BMBB are only admitted to the PhD program (see note below) under the auspices of Molecular, Cellular and Structural Biology (MCSB), a first-year program administered by BMBB and the Molecular, Cellular, Developmental Biology and Genetics (MCDB&G) graduate programs. After the first year, students select either BMBB or MCDB&G to complete their degree.

Note: One cannot apply for admission to the master's degree in BMBB. Students are only admitted to the BMBB PhD program. Alternative, related master's degree programs that admit students are the master's of biological Sciences (MBS) (<http://cce.umn.edu/master-of-biological-sciences>) and the master's in microbial engineering (<http://bti.umn.edu/MicE/>).

Program Delivery

This program is available:

- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission

The program can accommodate for a variety of educational backgrounds. However, applications from students with an undergraduate degree in the biological, chemical, or physical sciences are encouraged.

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Other requirements to be completed before admission:

Recommended academic preparation includes one year each of calculus, organic chemistry, and basic biology, including biochemistry and genetics. For students of demonstrated ability, background deficiencies can be made up during the first year of graduate study.

Successful applicants must have previous research experience in an academic or industrial setting, in addition to any course-related laboratory experiences. It is important to demonstrate familiarity, with an aptitude for basic science research prior to embarking on a graduate career in this program.

***Note: Students are admitted only to the PhD program for BMBB (see additional note below).

Special Application Requirements:

Additionally, applicants must submit three letters of recommendation from persons familiar with their academic and research capabilities. A statement of interests and goals, a complete set of transcripts, and official scores from the General Test of the GRE are required. The GRE Subject Test in biochemistry, cell and molecular biology, biology, or chemistry is strongly recommended, but not required.

The deadline to submit a completed application is December 1. Completed files are reviewed between January and February. Graduate studies begin fall semester only.

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Applicants must submit their test score(s) from the following:

- GRE

Key to [test abbreviations](#)(GRE).

For an online application or for more information about graduate education admissions, see the [General Information](#) section of the catalog website.

Program Requirements

Plan A: Plan A requires 20 major credits, 0 credits outside the major, and 10 thesis credits. The final exam is oral.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.0 is required for students to remain in good standing.

All students are expected to participate in seminars involving student reports on current literature and research.

Biochemistry Core (1 Credit)

Take the following core course for 1 credit:

[BIOC 8401](#) - Ethics, Public Policy, and Careers in Molecular and Cellular Biology (1.0 cr)

Laboratory and Field Course (1 Credit)

Take MCDG 8920 for at least 1 credit. In August of the first year, BMBB students must register for this hands-on, intensive lab course that takes place at the Itasca Biological Station and Laboratories, which provides first-year students with exposure to a range of modern methods and model systems.

[MCDG 8920](#) - Special Topics (1.0 - 4.0 cr)

Module Options (6 Credits)

Complete 6 credits in consultation with the director of graduate studies.

[BIOC 5535](#) - Introduction to Modern Structural Biology -- Diffraction (2.0 cr)

[BIOC 5536](#) - Introduction to Modern Structural Biology - Nuclear Magnetic Resonance (2.0 cr)

[BIOC 8005](#) - Biochemistry: Structure and Catalysis (2.0 cr)

[BIOC 8006](#) - Biochemistry: Metabolism and Control (2.0 cr)

[BIOC 8007](#) - Molecular Biology of the Genome (2.0 cr)

[BIOC 8008](#) - Molecular Biology of the Transcriptome (2.0 cr)

Electives (12 Credits)



Take 12 credits of coursework in one of the four BMBB emphases: synthetic biology and biotechnology, molecular biology, metabolic and systems biology, or chemical and structural biology. Courses from disciplines other than BMBB, in consultation with the advisor, may be used to build an emphasis.

Take 12 or more credit(s) from the following:

- [BIOC 5352](#) - Biotechnology and Bioengineering for Biochemists (3.0 cr)
- [BIOC 5361](#) - Microbial Genomics and Bioinformatics (3.0 cr)
- [MICA 8002](#) - Structure, Function, and Genetics of Bacteria and Viruses (4.0 cr)
- [GCD 8151](#) - Cellular Biochemistry and Cell Biology (2.0 - 4.0 cr)
- [MICA 8003](#) - Immunity and Immunopathology (4.0 cr)
- [MICA 8004](#) - Cellular and Cancer Biology (4.0 cr)
- [GCD 8131](#) - Advanced Molecular Genetics and Genomics (3.0 cr)
- [GCD 8008](#) - Mammalian Gene Transfer and Genome Engineering (2.0 cr)
- [PUBH 6450](#) - Biostatistics I (4.0 cr)
- [SCB 8181](#) - Stem Cell Biology (3.0 cr)
- [STAT 5021](#) - Statistical Analysis (4.0 cr)
- [MICA 8010](#) - Microbial Pathogenesis (3.0 cr)
- [BIOC 5216](#) - Current Topics in Signal Transduction (2.0 cr)
- [BIOC 5527](#) *{Inactive}*(4.0 cr)
- [BIOC 5528](#) - Spectroscopy and Kinetics (4.0 cr)
- [CHEN 8754](#) - Systems Analysis of Biological Processes (3.0 cr)
- [BIOC 5213](#) *{Inactive}*(3.0 cr)
- [BIOC 5444](#) - Muscle (3.0 cr)
- [CHEM 8011](#) - Mechanisms of Chemical Reactions (4.0 cr)
- [CHEM 8021](#) - Computational Chemistry (4.0 cr)
- [CHEM 8411](#) - Introduction to Chemical Biology (4.0 cr)
- [CHEM 8412](#) - Chemical Biology of Enzymes (4.0 cr)
- [CHEM 8735](#) - Bioinorganic Chemistry (4.0 cr)
- [PHCL 5111](#) - Pharmacogenomics (3.0 cr)
- [PUBH 7445](#) - Statistics for Human Genetics and Molecular Biology (3.0 cr)
- [MICA 8013](#) - Translational Cancer Research (2.0 cr)
- [GRAD 8101](#) - Teaching in Higher Education (3.0 cr)
- [GRAD 8200](#) - Teaching and Learning Topics in Higher Education (1.0 cr)
- [BIOC 5309](#) - Biocatalysis and Biodegradation (3.0 cr)
- [BIOC 5351](#) - Protein Engineering (3.0 cr)
- [CSCI 5461](#) - Functional Genomics, Systems Biology, and Bioinformatics (3.0 cr)
- [GRAD 5102](#) - Preparation for University Teaching for Nonnative English Speakers (2.0 cr)
- [BIOC 8184](#) - Graduate Seminar (1.0 cr)
- [BIOC 8084](#) - Research and Literature Reports (1.0 cr)
- [BIOL 8100](#) - Improvisation for Scientists (1.0 cr)
- [GCD 5005](#) - Computer Programming for Biology (3.0 cr)

Thesis Credits

Take at least 10 master's thesis credits.

- [BIOC 8777](#) - Thesis Credits: Master's (1.0 - 18.0 cr)