Master of Science in Applied Molecular Biology

Greenquist 344 • 262-595-2744 • Keyword: *Biology*

Degree Offered:
Master of Science.

Participating faculty from Biological Sciences Department

Professors:
Wallen, Ph.D.

Associate Professors:
Gundersen, Ph.D.; Mayer, Ph.D.; Thomson, Ph.D.

Assistant Professors:
Barber, Ph.D.; Higgs, Ph.D.; Pham, Ph.D.; Ruffolo, Ph.D.; Skendzic, Ph.D.

Participating faculty from Chemistry Department

Associate Professor:
Wood, Ph.D.

Goals of the Program

The program provides advanced training in the theory and application of molecular biology, in conjunction with supervised independent research culminating in a research thesis. Graduates perform at an advanced technical level in biotechnology and related industries or continue their education in Ph.D. or professional programs.

The faculty of the Master of Science in Applied Molecular Biology Program have active research programs in the following areas: prokaryotic and eukaryotic gene expression, genome organization, gene structure and DNA-protein interaction, microbial pathogenesis, insect genetics and molecular biology, molecular evolution, phylogenetic analysis, reproductive physiology, enzymology, and protein biochemistry.

Course of Study

There are two routes to a master of science degree in applied molecular biology: (a) a two-year graduate program in which students with a B.S. degree in biology, biochemistry, chemistry, or one of the life sciences may enroll; (b) a five-year combined B.S./M.S. program into which UW-Parkside undergraduates in the molecular biology and bioinformatics major are accepted at the end of their third year. At the end of their fourth year, these students receive a B.S. in molecular biology and bioinformatics.

Summary of Graduate Course Requirements

PLAN A: TWO-YEAR PROGRAM

The curriculum is divided into three components: the core, electives and thesis. A minimum of 30 graduate credits (courses numbered 500-799) are required for the degree. Some graduate courses are cross listed with undergraduate offerings (courses numbered 300-499). These are marked with an asterisk (*) in the list below. Courses taken at the undergraduate level cannot be repeated.

Core

BIOS 675	Advanced Molecular Biology	3 cr
BIOS 731	Seminar in Molecular Biology	4 cr

Electives

Students must complete a minimum of 6 elective credits. Electives must be approved by the student's thesis committee. Electives will be chosen to complement the student's previous education and experience, and to support the student's educational and career goals.

BIOS 611	Molecular Microbiology	3 cr
BIOS 614	Molecular Evolution*	3 cr
BIOS 653	Molecular Biology and Bioinformatics I: DNA*	4 cr
BIOS 654	Molecular Biology and Bioinformatics II: RNA*	4 cr
BIOS 655	Molecular Biology and Bioinformatics III: Proteins*	4 cr
BIOS 670	Adv. Molecular Genetics	3 cr
BIOS 680	Bioinformatics*	4 cr
BIOS 682	Adv. Bioinformatics: Genomics*	1 cr
BIOS 683	Adv. Bioinformatics: Proteomics*	1 cr
BIOS 690	Adv. Topics in Molecular Biology	1-4 cr
BIOS 699	Independent Study	3 cr
CHEM 620	Advanced Biochemistry*	3 cr

Thesis

Students are required to complete a research thesis. Students enroll in BIOS 711 for 17 credits or less depending on the number of elective credits. Fulfillment of the thesis requirement depends upon satisfactory completion, documentation, and oral presentation of the thesis research, as judged by the student's thesis committee.

PLAN B: COMBINED B.S./M.S. PROGRAM

Students in this program meet Plan A requirements with the following modifications: only 2 credits of BIOS 731 are required; research completed to meet the undergraduate senior thesis requirement may be applied to completion of the M.S. thesis. A minimum of 30 graduate credits (courses numbered 500-799) are required for the degree. Elective course requirements are defined by each student's thesis committee.

Admission Requirements

Plan A: Two-year Program.

To qualify for admission an applicant must have:

l. B.S. or B.A. degree from a regionally accredited institution.

2. Grade point average (GPA) of at least 3.00 in their major (4.00 basis).

3. Satisfactory Graduate Record Examination scores.

4. Completed the following courses, or their equivalents:

Chemistry: two semesters of general chemistry, two semesters of organic chemistry.

Biology: two semesters of introductory biology with laboratory, one semester of genetics, one semester of biochemistry, one semester of molecular biology with laboratory, and one additional upper-level laboratory course.

Physics: two semesters of physics.

Mathematics: two semesters of calculus, or one semester of calculus and one semester of discrete mathematics or probability.

Plan B: Combined B.S./M.S. program.

Students in the molecular biology and bioinformatics B.S. program can apply for admission to the M.S. program in the spring of their junior year. To qualify for admission an applicant must have:

l. Cumulative GPA of at least 3.30 (4.00 basis).

2. Approval of the Molecular Biology Programs Committee.

Application Procedure

Application materials may be obtained from the Applied Molecular Biology Program Office, Biological Sciences, UW-Parkside, 900 Wood Road, P.O. Box 2000, Kenosha, WI 53141-2000. Applications may also be made online at www.uwp.edu Keyword: *biological sciences*. To apply to the program a student must submit the following:

l. A completed application form.

2. A non-refundable application fee, payable to UW-Parkside.

3. GRE scores and official transcripts sent directly to the Master in Science in Applied Molecular Biology Program office by each undergraduate and post-graduate institution the applicant attended.*

4. Curriculum vitae.*

5. Three letters of recommendation.*

6. (Optional) Additional materials such as those listed below for applicants seeking probationary admission.

* Items marked with an asterisk are not required for students completing their B.S. degree at UW-Parkside.

International students whose native tongue is not English are required to meet the additional requirements in the section "International Students" (use the index of this catalog to find this information).

Admission on Probation

Under unusual circumstances a program faculty member may recommend probationary admission for an applicant who has not met all admission requirements, provided other substantial evidence of capacity to do satisfactory graduate work is presented. This evidence could include letters of recommendation and/or evidence of work experience related to the program. Students missing one or more prerequisites or courses will be considered for probationary admission. Deficiencies must be made up by the end of the first year of enrollment.

Financial Assistance

Stipends (research assistantships, traineeships) are available to a limited number of students; most cover only part of the cost of attendance.

Continuation

1. The Master of Science in Applied Molecular Biology Program requires a cumulative GPA of 3.00 (B) or better in all graduate courses taken in the program unless conditions for probationary status require higher grades.

2. With approval of the department's graduate committee, students with a grade of C in a graduate course may be allowed to continue. However, a maximum of two C's is allowed.

3. Students who have finished all course and credit requirements (30 credits) and are still working on a thesis project require a continuous registration of at least l credit each fall and spring semester. Students who have not maintained continuous registration must apply for reinstatement.

4. Students should select a faculty adviser at the time of matriculation or at least by the end of the first semester. With the assistance of the adviser, the student will formulate a research problem. The adviser will provide space, equipment and supplies, and technical assistance when possible. By the end of the first semester, the student should select a thesis committee that consists of the faculty adviser and two other faculty members. The thesis committee provides oversight of the student's research progress and approves the student's course of study. The program culminates in a written thesis that thoroughly documents the research activity, and an oral presentation open to the public.

Time Limit

It is expected that most students will complete the degree within two years. A candidate for the M.S. degree who fails to complete the degree within three years will be placed on probation for one semester before being dropped from the program. Exceptions to this limit require authorization by the Molecular Biology Programs Committee.

Transfer Student Admissions

Transfer applicants who are admitted to the Master of Science in Applied Molecular Biology Program receive a statement of advanced standing indicating which courses have been accepted from the previous institutions and how they equate to UW-Parkside courses; the statement also identifies their adviser. Students should contact their adviser as soon as possible after receiving the statement of advanced standing. Generally, students are allowed to transfer up to 12 credits of graduate work from regionally accredited institutions.

Biology (BIOS) Courses In Applied Molecular Biology

503 Microbiology .....4 cr
Prereq: BIOS 101 and 102 and CHEM 322, or consent of instructor. Freq: Spring.
Advanced investigation into microbial structure and growth, microbial genetics, microbial pathogenesis, medical microbiology, and microbial ecology. Three-hour lecture; one three-hour lab.

509 Molecular Biology.....3 cr
Prereq: BIOS 260, CHEM 322 or consent of instructor. Freq: Spring.
Regulation of DNA, RNA, and protein synthesis and the control of the synthesis of other macromolecules. Three-hour lecture/discussion.

611 Microbial Pathogenesis .....3 cr
Prereq: An upper-level course in microbiology or molecular biology, or consent of instructor. Freq: Alternate years.
Focus on the concepts of microbial molecular biology and their application to current biotechnology.

614 Molecular Evolution.....3 cr
Prereq: BIOS 309 (or 509) or 314, or consent of instructor. Freq: Alternate Springs.
The evolution of nucleic acids and proteins. Five major topics are considered in turn: genetic variability; the causes of molecular evolution and the neutral theory; methods of detecting genetic variability; the use of molecular markers for estimating phylogeny; and the evolution of genome structure. Three-hour lecture/discussion.

653 Molecular Biology and Bioinformatics I: DNA.....4 cr
Prereq: BIOS 240 (or 301 and 307), 309 (or 509), 260, and consent of instructor. Freq: Fall.
Techniques and theory of DNA isolation and analysis including laboratory and computational methods. Eight-hour lecture/lab.

654 Molecular Biology and Bioinformatics II: RNA.....4 cr
Prereq: BIOS 240 (or 301 and 307), 309 (or 509), 260, and consent of instructor. Freq: Fall.
Theory and techniques for investigating RNA. Common laboratory methods for isolating and characterizing RNA will be performed. In addition, computer applications will be used to study RNA bioinformatics, structure, and function. Eight-hour lecture/lab.

655 Molecular Biology and Bioinformatics III: Proteins....4 cr
Prereq: BIOS 240 (or BIOS 301 or BIOS 307), 309 (or 509), 260, and consent of instructor. Freq: Spring.
The role of proteins in biology will be assessed, providing both an understanding of these macromolecules and practical experience in biochemistry. In particular, comprehension of protein characteristics and function will be emphasized to provide insight into cell physiology or functional genomics. Eight-hour lecture/lab.

670 Advanced Molecular Genetics .....3 cr
Prereq: BIOS 309 (or 509), 260 and consent of instructor. Freq: Occasionally.
In-depth coverage of selected current research topics in the molecular genetics of genomes, gene and gene expression.

675 Advanced Molecular Biology.....3 cr
Prereq: BIOS 309 (or 509), 260 and consent of instructor. Freq: Fall.
In-depth coverage of selected current research topics in the molecular biology of DNA replication, transcription, translation, and other current topics of molecular biology.

680 Bioinformatics .....4 cr
Prereq: BIOS 309 (or 509), 260, and consent of instructor. Freq: Fall.
Various aspects of bioinformatics relating to data management, data discrimination, genomics, and proteomics will be introduced to students. Lectures and computer-based exercises will emphasize basic theory and applications of this information in today's world. Three-hour lecture, three-hour lab.

682 Advanced Bioinformatics: Genomics.....1 cr
Prereq: BIOS 480. Freq: Occasionally.
Theory and techniques will be presented to provide students with a perspective on the essence of life: genomic sequences. Lectures and computer-based exercises will emphasize the information content of genomic DNA and its application in today's world. Two-hour lecture/lab.

683 Advanced Bioinformatics: Proteomics.....1 cr
Prereq: BIOS 480, consent of instructor. Freq: Occasionally.
The field of bioinformatics has revolutionized the study of gene expression. A combination of lecture, lab, and computer-based exercises will provide students with expertise in the use of bioinformatic tools to assess gene expression and functional genomics. Two-hour lecture/lab.

699 Independent Study .....1-3 cr
Prereq: Written consent of instructor. Freq: Fall, Spring.
Advanced study performed under the supervision of a regular faculty member. Suitability as an elective for the master's of applied molecular biology is determined on a case-by-case basis by the MAMB program committee.

711 Thesis .....1-9 cr
Prereq: Written consent of instructor. Freq: Fall, Spring.
Dissertation for master of science in applied molecular biology. Graded on a credit/no credit basis.

731 Seminar in Molecular Biology.....1 cr
Prereq: BIOS 309 (or 509) and consent of instructor. Freq: Fall, Spring.
Research reports, special topics, and reports from recent literature in molecular biology or biotechnology. Graded on a credit/no credit basis.

Chemistry (CHEM) Courses In Applied Molecular Biology

620 Advanced Biochemistry.....3 cr
Prereq: BIOS 240 or CHEM/BIOS 307 or CHEM 324 or consent of instructor. Freq: Spring, even years.
Advanced topics in biochemistry including thermodynamics, protein structure, and enzyme kinetics and mechanisms. Not open to students with credit in CHEM 410.