BIOCHEMISTRY - DOCTOR OF PHILOSOPHY (PHD)

The Department of Biochemistry is internationally recognized for its research and education and offers a world-class interdisciplinary research environment in a beautiful mountain setting. As part of a commitment to continuing this tradition of excellence, the department provides a graduate program that integrates opportunities for cutting-edge creative research and study across a wide range of areas including:

- Computational biology
- Nucleic acids
- Gene expression
- Cell signaling
- Membranes
- Proteins and enzymology
- Molecular biophysics
- Structural biology
- Systems biology

Graduate students enjoy extensive scientific collaboration with biochemistry faculty, with other departments such as molecular, cellular and developmental biology, chemistry and physics, and with research institutes such as the BioFrontiers Institute, Joint Institutes of Laboratory Physics (JILA) and the Renewable and Sustainable Energy Institute (RASEI).

Requirements

Course Requirements

Sixty credit hours of coursework is required, consisting of 30 hours of research in BCHM 8991, at least 15 hours in formal courses and the remainder in other courses, such as lecture and seminar courses, group meeting courses and research in BCHM 6901. All students are required to take a 1-credit course in Scientific Ethics and Responsible Conduct in Research GRAD 5000.

A minimum grade of B- is required in all courses counting for the PhD degree; students must maintain a cumulative GPA of 3.0 in all formal courses and an overall grade point average of 3.0 or they will be placed on academic probation. Students may also be placed on probation if they are not making satisfactory progress in their research. Students on probation will not have a high priority for financial support.

Plan of Study

The plan of study varies by student. See the Plan(s) of Study (p. 2) section for a sample course plan.

Common Electives

Code	Title	Credit Hours
BCHM 5312	Quantitative Optical Imaging	3-4
BCHM 5491	Modern Biophysical Methods	3
BCHM 5631	Computational Genomics Lab	3
BCHM 5801	Advanced Signal Transduction and Cell Cycle Regulation	3
BCHM 5850	Therapeutic and Diagnostic Nucleic Acids	3
MCDB 5471	Mechanisms of Gene Regulation in Eukaryotes	3
MCDB 5520	Bioinformatics and Genomics	3
MCDB 5680	Mechanisms of Aging	3
MCDB 5811	Teaching and Learning Biology	3
EBIO 5460	Special Topics	1-5
EBIO 5800	Critical Thinking in Biology	3
CSCI 5314	Dynamic Models in Biology	3

Research Requirements

During the course of the PhD thesis work, students will arrange annual meetings with a thesis advisory committee composed of their research advisor and two to four other biochemistry faculty. The purpose of these advisory meetings is to ensure the student is making adequate progress on a suitable PhD thesis project. The final annual meeting should be scheduled about one year from the end of the thesis work. For this meeting, the advisory committee will be expanded to five faculty members: the thesis advisor, three biochemistry faculty and one faculty member from another department. This committee will become the examination committee that evaluates the results of a completed research program submitted as a thesis for the final examination as described above.

Examination Requirements

Each PhD student is required to satisfy a preliminary examination and pass a series of Comprehensive Examinations to be advanced to candidacy. The candidate must then pass a final thesis defense examination to be awarded the PhD degree. Interdisciplinary students should adhere to specific program requirements.

Preliminary Examinations

The Biochemistry preliminary examination will be conducted at the beginning of the student's third semester. The record of each student, including undergraduate preparation, performance in graduate coursework, TA performance and performance in laboratory rotations will be reviewed, and a recommendation will be made on the qualification of the student to continue in the PhD program. Outcomes may include recommendation for additional coursework, delay in joining a research lab or a recommendation to leave the program. Students who are considering interdivisional work should consult the Biochemistry Graduate Committee for advice on the preliminary examination requirement.

Comprehensive Examinations

The Comprehensive Examinations are made up of three parts: a Written Examination, an Oral Examination and the evaluation of an original research proposal. The oral examination and the research proposition evaluation shall be conducted by a five member examining board, according to the rules of the Graduate School. The Comprehensive Examinations are considered passed, and the student can advance to Candidacy when the requirements of all parts have been met.

Final Examination

A doctoral student must write a dissertation based upon original investigation, demonstrating mature scholarship and critical judgment, as well as familiarity with tools and methods of research, conducted under the supervision of a graduate faculty member. The dissertation must fulfill all Graduate School requirements. After the dissertation is completed, an oral final examination on the dissertation and related topics is conducted by the student's doctoral committee.

Time Limit

All degree requirements must be completed within six years of the date of commencing coursework.

Plan(s) of Study

Below is a sample course plan for first and second year students. In their third through sixth years, students typically complete dissertation research (BCHM 8991, repeatable for up to 30 credit hours) and finish elective coursework.

First Year		Credit Hours
BCHM 5781	Advanced General Biochemistry 2	5
GRAD 5000	Responsible Conduct of Research	1
BCHM 5770	Fundamentals of Biochemistry I	3
BCHM 5772	Quantitative Reasoning in Biochemistry	1
BCHM 5774	Introduction to your Biochemistry PhD	1
BCHM 6901	Research in Biochemistry (Repeatable for up to 15 credit hours)	7
	Credit Hours	**18**
Second Year		
Elective courses (2)	Student Choice - check with advisor or grad program director	6
BCHM 6901	Research in Biochemistry (Repeatable for up to 15 credit hours)	6
BCHM 5830	Scientific Communication in Biochemistry	1
	Credit Hours	**13**
	Total Credit Hours	**31**

Learning Outcomes

By the completion of the program, students will be able to:

- Demonstrate expertise of knowledge in the discipline and demonstrate the ability to synthesize arguments through academic writing.
- Design and conduct high-quality original research in the discipline.
- Effectively communicate and present research to academic or public audiences in both written and oral form.