

Biomedical Science, PhD

Molecular Medicine

The Doctor of Philosophy in biomedical science with a molecular medicine subprogram provides interdisciplinary training in the concepts and methodologies fundamental to the investigation of biological processes and molecular mechanisms that relate to human disease. The PhD requires a minimum of 72 s.h. of graduate credit. Students must maintain a cumulative grade-point average of at least 3.00 to earn the degree.

Students enter the molecular medicine subprogram through the Biomedical Science Program. The Biomedical Science Program is designed to provide students maximum flexibility during the first year of graduate studies to take a course of study compatible with several programs while completing research rotations. At the end of the first year, students choose a subprogram affiliation.

The curriculum is a sequence of required and elective courses, which provides students with broad exposure to areas including molecular biology, cell biology, biochemistry, and integrative sciences. It ensures a comprehensive exposure to conceptual and experimental aspects of molecular and cellular biology and translational studies. Sufficient flexibility is provided so that students can adapt the program to permit specialization in their own area of interest. Faculty members are involved in a variety of research projects involving molecular and cellular biology and molecular medicine.

The PhD in biomedical science with a molecular medicine subprogram requires the following coursework.

Typical Curriculum

First Year

See the Core Curriculum [p. 1] at the beginning of the PhD in biomedical science section of the catalog for a typical first-year schedule.

Second Year

Students select coursework from the following three track areas: metabolic disorders, cardiovascular biology, and molecular and cellular medicine (general).

| Course # | Title | Hours |
|-----------|--|-------|
| BMED:7270 | Scholarly Integrity/ Responsible Conduct of Research I | 0 |
| MMED:6280 | Critical Thinking in Molecular Medicine | 1 |
| MMED:7290 | Seminars in Molecular Medicine | 1 |
| Electives | | 1-3 |

Students select coursework from the following three track areas: metabolic disorders, cardiovascular biology, and molecular and cellular medicine (general).

Metabolic Disorders

| Course # | Title | Hours |
|-----------|---|-------|
| BMB:7253 | Introduction to Metabolism | 1 |
| BMB:7255 | Metabolism II | 1 |
| MMED:6230 | Pathogenesis of Metabolic and Cardiovascular Disorders | 3 |
| MMED:6280 | Critical Thinking in Molecular Medicine | 1 |
| MMED:7310 | Translational Medicine Education Rounds (taken fall and spring semesters) | 1 |

Cardiovascular Biology

| Course # | Title | Hours |
|-----------|---|-------|
| MMED:6230 | Pathogenesis of Metabolic and Cardiovascular Disorders | 3 |
| MMED:6280 | Critical Thinking in Molecular Medicine | 1 |
| MMED:7310 | Translational Medicine Education Rounds (taken fall and spring semesters) | 1 |
| Elective | | 3 |

Molecular and Cellular Medicine (General)

| Course # | Title | Hours |
|--|---|-------|
| MMED:6220/ ACB:6220/ MPB:6220 | Mechanisms of Cellular Organization | 3 |
| MMED:6280 | Critical Thinking in Molecular Medicine | 1 |
| MMED:7310 | Translational Medicine Education Rounds (taken fall and spring semesters) | 1 |
| Related coursework from list in the molecular medicine Graduate Student Guidelines | | 2 |
| 3 s.h. from these: | | |
| MMED:3310/ BMB:3310/ CBIO:3310 | Practical Data Science and Bioinformatics | 3 |
| MMED:6226/ ACB:6226/ MPB:6226 | Cell Cycle Control | 1 |
| MMED:6227/ ACB:6227/ MPB:6227 | Cell Fate Decisions (elective, 1s.h. maximum) | 1 |
| PCOL:6225 | Growth Factor Receptor Signaling | 1 |
| Elective | | 1 |

Additional Requirements

Laboratory Rotations

To ensure that students obtain early involvement in laboratory research, they are required to register for research credits and complete three laboratory rotations during their first year of graduate study. In general, these rotations are in the laboratories of three different molecular medicine faculty members. In some cases, if approved by the molecular medicine program, students may be allowed to complete two of their rotations in the same laboratory.

Teaching

Students are required to complete a teaching requirement (3 s.h.). They may teach in a combination of 1 or 2 s.h. courses, or one 3 s.h. course. This teaching requirement must be met prior to the final dissertation defense and graduation. It is recommended that teaching occurs in the third year following the completion of the comprehensive examination.

Publication Requirements

Students are required to have a minimum of one first-author publication in a peer-reviewed journal. The article must be formally accepted and be in-press status or be published prior to graduation. A co-first-authored, peer-reviewed publication will count toward this requirement.

External Fellowship Application Requirement

Students are required to submit a fellowship to an external funding agency (i.e., National Institutes of Health, American Heart Association) within one year of completing their comprehensive examination or by a date that is mutually agreed upon by the student, the dissertation advisor, and the molecular medicine program.

Comprehensive Examination

Students are expected to complete the comprehensive examination, both written and oral components, before the beginning of their third year. The preliminary specific aims document can be submitted to the comprehensive examination committee any time after approval of the dissertation plan, but must be submitted before April 1. The committee evaluation of the specific aims will be returned to the student within one week. A rejected specific aims document must be revised and resubmitted within three weeks. The committee then has one week to evaluate the resubmitted specific aims. The specific aims must be accepted by a majority vote of the committee before a student can proceed with the development of a full proposal. Only two rounds of submission are allowed.

Following acceptance of the specific aims, a student must submit the written proposal within six weeks. The committee has two weeks to review the written document. The oral presentation to defend the written proposal should be scheduled as soon after the two weeks as possible or at the convenience of the committee. It is expected that all examinations will be completed by July 15, in advance of the end of the student's second year.

The detailed Molecular Medicine Graduate Student Guidelines are located under Program Information on the Molecular Medicine Program website.

Final Examination

The five-member thesis committee serves as an advisory body for the preparation of the thesis. It is expected that a student meets with the committee annually, although the candidate, thesis advisor, or the committee can request a meeting at any time. The final examination takes the form of a seminar presented to the program followed by a final thesis defense with committee members. The student is required to present a complete copy of the thesis to the thesis committee members at least two weeks prior to the final defense date.

Combined Programs

PhD/MD

Students may work toward the Doctor of Medicine degree and a PhD in biomedical science (molecular medicine subprogram) in a combined degree program offered by the Graduate College and the Carver College of Medicine. Applicants must be admitted to both programs before they may be admitted to the combined degree program. See the Medical Scientist Training Program (Carver College of Medicine) in the catalog.