

Biomedical Science, PhD

Cancer Biology

The Doctor of Philosophy in biomedical science with a cancer biology subprogram 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 cancer biology subprogram provides training in many areas of research—cell biology, genetics, immunology, and cell metabolism, among others—that are necessary to understand the complexities of cancer etiology and treatment.

The subprogram does not offer a master's degree. Cancer biology is affiliated with the Holden Comprehensive Cancer Center, which was founded in 1980 and has been designed as a National Cancer Institute NCI-Designated Cancer Center since 2000.

The curriculum is a sequence of required and elective courses that provide students with advanced knowledge in current concepts related to molecular, cellular, and genetic processes that contribute to the development and treatment of cancer. It also provides specialized training in experimental methodology used to study cancer in a laboratory setting. Cancer biology prepares students for a variety of career paths in academic, clinical, and industry environments that deal with the study and/or treatment of cancer.

Students gain clinical exposure by shadowing oncologists. They are expected to have a solid background in chemistry, mathematics, and the biological sciences. They should have completed undergraduate coursework in introductory biology and chemistry, biochemistry, genetics, organic chemistry, physical chemistry, and calculus, and previous coursework in cancer biology is desirable. Deficiencies in a particular area, as determined by the Graduate Studies Committee, can be remedied by the completion of appropriate courses.

Selection of a PhD mentor (thesis advisor) is normally finalized near the end of the spring semester of a student's first year of study. The deadline for selection is determined by the Biomedical Science Program.

Students are required to complete the following core courses prior to their comprehensive examination. Students who wish to take the comprehensive examination should first make arrangements in consultation with their mentor, the program director, and the Student Advisory Committee. The exam is typically completed during the second summer of study.

The PhD in biomedical science with a cancer biology subprogram requires the following coursework.

Core Cancer Biology Curriculum

Course #	Title	Hours
BMED:7270	Scholarly Integrity/ Responsible Conduct of Research I	0
BMED:7271	Scholarly Integrity/ Responsible Conduct of Research II	0
CBIO:5500	Topics in Cancer Biology	1
CBIO:6000	Seminar: Cancer Research	1
CBIO:6500	Research in Cancer Biology	arr.
CBIO:7000	Clinical Connections	1
CBIO:7001/ FRRB:7001/ PATH:7001	Molecular and Cellular Biology of Cancer	3
CBIO:7500	Crafting a Scientific Proposal	1
Elective		

Typical Curriculum

First Year, Fall

Course #	Title	Hours
BMED:5207	Principles of Molecular and Cellular Biology	3
BMED:5208	Topics in Principles of Molecular and Cellular Biology	1
BMED:7777	Biomedical Science Seminar	1
BMED:7888	Biomedical Science Research	6
PCOL:5204	Basic Biostatistics and Experimental Design	1
Elective		3

First Year, Spring

Course #	Title	Hours
BMED:7777	Biomedical Science Seminar	1
BMED:7888	Biomedical Science Research	6
CBIO:7001/ FRRB:7001/ PATH:7001	Molecular and Cellular Biology of Cancer	3
MMED:6260	Methods for Molecular and Translational Medicine	1
PATH:5270/ IGPI:5270/ MMED:5270	Pathogenesis of Major Human Diseases	3
PHAR:6504	Mastering Reproducible Science	1

Second Year, Fall

Course #	Title	Hours
BMED:7270	Scholarly Integrity/ Responsible Conduct of Research I	0
CBIO:5500	Topics in Cancer Biology	1
CBIO:6000	Seminar: Cancer Research	1
CBIO:6500	Research in Cancer Biology	6
CBIO:7000	Clinical Connections	1

CBIO:7500	Crafting a Scientific Proposal	1
Elective		3

Second Year, Spring

Course #	Title	Hours
BMED:7271	Scholarly Integrity/ Responsible Conduct of Research II	0
CBIO:5500	Topics in Cancer Biology	1
CBIO:6000	Seminar: Cancer Research	1
CBIO:6500	Research in Cancer Biology	6
Elective		1

Additional Requirements

Laboratory Rotations

In order to gain more widespread experience in cancer biology research and to aid in selecting a laboratory home and thesis project, students perform three laboratory rotations prior to the selection of a thesis advisor. Laboratory rotations are normally carried out in research laboratories of the cancer biology faculty. A rotation can be completed with a faculty member outside the cancer biology program with the permission of the program director.

Three rotations, 12 weeks in length, begin in the fall semester of the first year. The goal of the rotations is to gain a comprehensive view of the mentor's research program, to gain exposure to experimental methods used in the mentor's lab, and to learn about the mentoring styles of faculty members.

Teaching

The cancer biology program does not require teaching. Students with an interest in teaching experience are encouraged to discuss their career plans with their mentor and/or the program director.

Publication Requirements

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

Comprehensive Examination

Students are eligible to take the comprehensive examination when they are in good academic standing as defined by the Graduate College—the student has completed all program core courses with a grade of at least B or has a non-letter grade of pass.

Written Examination

The comprehensive exam is on-topic, meaning the subject should be a student's current research being conducted in the mentor's lab. Students normally take the comprehensive exam during the second spring or summer of their enrollment in the program. They submit a written exam, if that is acceptable to the comprehensive examination committee, and then prepare for an oral examination.

Oral Examination

The purpose of the oral examination is to determine whether the student's written submission adequately represents the student's knowledge. A student may be queried on

issues beyond the scope of the written proposal to allow the committee to determine the student's general depth of knowledge.

Final Examination

The thesis committee is selected by each student after the successful completion of the comprehensive examination. Students are eligible for their oral thesis defense after completing 72 s.h. of coursework, publication of at least one primary author manuscript or having one in press status, and with consent of the thesis committee. The procedures are the same as for the comprehensive examination.

Combined Programs

PhD/MD

Students may work toward the Doctor of Medicine degree and a PhD in biomedical science (cancer biology 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.