BIOINFORMATICS AND COMPUTATIONAL BIOLOGY (PH.D.)

Doctor of Philosophy. Major in Bioinformatics and Computational Biology.

Admission to this program is highly competitive; meeting admission requirements is not a guarantee of admission. Students who wish to enter the doctoral degree program must demonstrate mathematical maturity, skill in the use of high-level programming language, and a basic knowledge of molecular biology. However, students lacking one of these may be admitted with the requirement that they make up the deficiency. The minimum admission requirements are at least a 3.0 undergraduate GPA if the student graduated within the last five years, although this may be waived under exceptional circumstances. Students for whom English is a second language must have a TOEFL score of 600 (250 computer-based or 100 IBT) or higher. Applicants must provide at least three letters of reference speaking to the applicant's aptitude for graduate research and a statement of research interests that clearly identifies the research the student would like to pursue and why they want to pursue it at the University of Idaho.

The Ph.D. degree requires a dissertation and students will take at least 30 research and dissertation credits BCB 6000. Doctoral dissertations for a BCB degree will demonstrate a high level of scholarly achievement and will represent a significant, original contribution to the field. In addition to the dissertation, students will publish their work in appropriate peer-reviewed venues. Students will present their dissertations publicly at their final defense.

Each student's graduate committee will consist of at least four faculty members. This committee will represent the three BCB disciplines (biological sciences, computer sciences, and mathematical sciences) and will include at least three participating BCB faculty members. Co-advising by major professors in different disciplines will be particularly attractive for BCB degrees and is possible at the discretion of the student and their committee. There is no explicit requirement for an "external" committee member since each committee will already include faculty from at least three different disciplines.

There will be no qualifying examination. The Ph.D. will require a preliminary examination, which will be taken no later than the end of the fifth semester. The preliminary examination will have three components. First, it will include a written dissertation proposal prepared in the format of a federal research grant and submitted to the committee at least four weeks prior to the oral examination. Second, there will be a public, oral presentation of the research proposal. Third, the committee will conduct a non-public oral examination in which committee members will ask questions about the proposed research and about background and core coursework.

Incoming students admitted with background deficiencies will take background courses. For example, biology majors with little formal introduction to computation will take background courses in computer science. The specific required background courses will be determined by the students' graduate committees with the approval of the program director. Note that credits from courses numbered 3000 and below do not count toward the BCB degree requirements, though they may be required to fulfill deficiencies.

The core courses form a central, shared educational experience for all BCB students. These courses will enable them to share a common language and to discuss problems from multiple disciplinary points of view. This shared experience will also give BCB students a sense of identity and community, which will encourage them to help each other overcome cultural and terminological differences that usually make such interdisciplinary interactions challenging. When possible and appropriate, core courses will include group projects using team members with backgrounds in different disciplines.

The depth courses provide more detailed knowledge of bioinformatics and computational biology, and provide the springboard for graduate research. The list of courses will evolve with the research interests of the BCB faculty participants, and more will be added as new faculty members join the program. See the program webpage at www.uidaho.edu/cogs/bcb (http://www.uidaho.edu/cogs/bcb/) for the latest information.

Other courses may be required as determined by the student's committee.

To explicitly make it easier to bridge the traditional gap between disciplines, the BCB program includes several bridging activities:

- **Seminars and Workshops:** Seminar series are available, and BCB students are required to participate. Seminars are an opportunity for students to interact with experts in a variety of fields. Workshops will provide practical experience with tools and techniques.
- **Lab rotations or Internships:** The lab rotation or internship is designed by the student and their thesis committee and provides practical experience in research questions and methods outside the major emphasis area of the student.
- **Teaching experience:** Each doctoral candidate will be required to have at least one semester of teaching experience relevant to the BCB program with the details of this requirement determined by their committee. This requirement may be satisfied, for example, by teaching a course, running a workshop, offering a supplement, or working as a teaching assistant.

The Ph.D. requires a minimum of 78 credits. The BCB program assumes the usual graduate full time load of at least 9 credits per semester. Note that the Ph.D. requires at least 18 credits of "other," supplemental, or workshop courses at the 4000-level or above since there are a total of 60 minimum required core, depth, research/dissertation, seminar, and laboratory credits, and the student must have at least 78 credits to graduate.

Ph.D. Degree

Code	Title	Hours
Core Courses:		
CS 5615	Computational Biology: Sequence Analysis	3
BIOL 5220	Molecular Evolution	3
MATH 5630	Mathematical Genetics	3
Depth Courses:		**15**
Students must complete at least 6 credits in Biological Sciences and 6 credits in Computer/Mathematical/Statistical Sciences		
Biological Sciences:		
BIOL 4210	Advanced Evolution	
BIOL 4440	Genomics	

BIOL 5260	Systems Biology	
BIOL 5450	Phylogenetics	
BIOL 5470	Virology	
BIOL 5540	Biochemistry II	
BIOL 5850	Prokaryotic Molecular Biology	
BIOL 5870	Cellular and Molecular Basis of Disease	
PLSC 5880	Genetic Engineering	
WLF 5610	Landscape Genetics	
Computer/Mathematical/Statistical Sciences:		
BCB 5240	Data Carpentries	
BIOL 5260	Systems Biology	
CS 5211	Parallel Programming	
CS 5701	Artificial Intelligence	
CS 5731	Evolutionary Computation	
MATH 4510	Probability Theory	
MATH 4520	Mathematical Statistics	
MATH 5380	Stochastic Models	
PHYS 5330	Statistical Mechanics	
STAT 5190	Multivariate Analysis	
STAT 5650	Computer Intensive Statistics	
Seminar:		**3**
BCB 5010	Seminar	
Lab Rotation:		**3**
Students with a math or computer science emphasis take BCB 5060 (biological science) and students with a biology emphasis take BCB 5070 (computer science) or BCB 5080 (mathematical science)		
BCB 5060	Laboratory Experience in the Biological Sciences	
BCB 5070	Laboratory Experience in the Computational Sciences	
BCB 5080	Laboratory Experience in Mathematics or Statistics	
BCB 5980	Internship	
Dissertation:		**30**
BCB 6000	Doctoral Research and Dissertation	
Teaching Requirement:		**3**
BCB 5970	Practicum	
Other:		**15**
Total Hours		**78**

For more information, please review the Bioinformatics and Computational Biology Graduate Handbook. (https://www.uidaho.edu/-/media/uidaho-responsive/files/sci/bcb/student-resources/bcb-forms/bcb_handbook_2024.pdf?rev=d6a5155a371341d298e65ae2e5b68941)

1. Obtain understanding of the disciplines of Bioinformatics and Computational Biology (BCB): the biological sciences, computational sciences, and mathematical sciences. Master the fundamental concepts of BCB from the perspective of each of the three program disciplines with the ability to integrate the multidisciplinary principles.
2. Acquire specialized expertise and master state-of-the-art research topics in one of the three BCB areas: biological sciences, computational sciences, or mathematical sciences.
3. Successfully propose significant and innovative interdisciplinary research by combining concepts and theories from the three BCB areas.