BIOINFORMATICS AND COMPUTATIONAL BIOLOGY (M.S.)

Master of Science. 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 master's 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.

There is a thesis and non-thesis track for the M.S. For the thesis track, students must complete at least 10 credits of BCB 500. M.S. theses for a BCB degree will demonstrate a high level of scholarly achievement, and students will present their thesis publicly at their final defense. For the non-thesis track, students must complete 5 credits of BCB 599, including a public presentation of research results.

For thesis track students, each 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 or preliminary examination for the M.S. degree.

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 or advisor with the approval of the program director. Note that credits from courses numbered 300 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 uidaho.edu/sci/bcb (https://catalog.uidaho.edu/colleges-related-units/science/bioinformatics-computational-biology/bioinformatics-computational-biology-ms/www.uidaho.edu/sci/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 a seminar series, 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.

The M.S. requires a minimum of 30 credits. The BCB program assumes the usual graduate full-time load of at least 9 credits per semester.

Required Courses (both thesis and non-thesis tracks)

Code	Title	Hours
Core Courses:		
BIOL 522	Molecular Evolution	3
or BIOL 545	Phylogenetics	
CS 515	Computational Biology: Sequence Analysis	3
MATH 563	Mathematical Genetics	3
Graduate Seminar:		**2**
BCB 501	Seminar	
Total Hours:		**11**

Thesis Track

Code	Title	Hours
Depth Courses:		**9**
Students must complete at least 3 credits in Biological Sciences and 3 credits in Computer/Mathematical/Statistical Sciences		
Biological Sciences		
BIOL 421	Advanced Evolution	
BIOL 444	Genomics	
BIOL 526	Systems Biology	
BIOL 545	Phylogenetics	
BIOL 547	Virology	
BIOL 554	Biochemistry II	
BIOL 585	Prokaryotic Molecular Biology	
BIOL 587	Cellular and Molecular Basis of Disease	
PLSC 588	Genetic Engineering	
WLF 561	Landscape Genetics	
Computer/Mathematical/Statistical Sciences		
BCB 524		
BIOL 526	Systems Biology	

CS 511	Parallel Programming	
CS 570	Artificial Intelligence	
CS 572	Evolutionary Computation	
MATH 428/528	Numerical Methods	
MATH 451	Probability Theory	
MATH 452	Mathematical Statistics	
MATH 538	Stochastic Models	
PHYS 533	Statistical Mechanics	
STAT 519	Multivariate Analysis	
STAT 565	Computer Intensive Statistics	
Thesis:		**10**
BCB 500	Master's Research and Thesis	
Total Hours		**19**

Courses and thesis to total 30 credits for degree

Non-Thesis Track

Code	Title	Hours
Depth Courses:		**14**
Students must complete at least 6 credits in Biological Sciences and 6 credits in Computer/Mathematical/Statistical Sciences. Up to 3 depth credits can be in workshops or directed studies.		
Biological Sciences		
BIOL 421	Advanced Evolution	
BIOL 444	Genomics	
BIOL 526	Systems Biology	
BIOL 545	Phylogenetics	
BIOL 547	Virology	
BIOL 554	Biochemistry II	
BIOL 585	Prokaryotic Molecular Biology	
BIOL 587	Cellular and Molecular Basis of Disease	
PLSC 588	Genetic Engineering	
WLF 561	Landscape Genetics	
Computer/Mathematical/Statistical Sciences		
BIOL 526	Systems Biology	
CS 511	Parallel Programming	
CS 570	Artificial Intelligence	
CS 572	Evolutionary Computation	
MATH 428/528	Numerical Methods	
MATH 451	Probability Theory	
MATH 452	Mathematical Statistics	
MATH 538	Stochastic Models	
PHYS 533	Statistical Mechanics	
STAT 519	Multivariate Analysis	
STAT 565	Computer Intensive Statistics	
Research:		**5**
BCB 599	Non-thesis Master's Research [1]	
Total Hours		**19**

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Must include a public presentation of research results.

Courses and research to total 30 credits for this degree

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. Be able to explain BCB concepts and research results to people with widely varying backgrounds: experts in the same and other fields as well as the general public.
4. Accomplish significant and innovative interdisciplinary research by combining concepts and theories from the three BCB areas.