Requirements for the M.S. Degree in Bioinformatics and Computational Biology

Students applying to the M.S. Degree program in Bioinformatics and Computational Biology (BCB) are expected to have a bachelor's degree in biology, computer science, mathematics, or a related field, and to have taken introductory courses in each of the three disciplines: biology, computer science, and mathematics. For example, a student with a bachelor's degree in biology is expected to have also completed courses in programming, data structures, calculus, and statistics prior to submitting an application.

Students pursuing the M.S. degree in Bioinformatics and Computational Biology must complete a minimum of 33 credits of relevant work at the graduate level. These 33 credits must satisfy the 6-9 credit M.S. thesis / internship requirement, and the 24-27 credit coursework requirement described in detail below. These M.S. degree requirements have been designed to provide a comprehensive yet flexible program to students who are pursuing an M.S. degree exclusively, students who are pursuing a combined B.S./M.S. degree, and students who plan to pursue a PhD degree later on.

Upon acceptance to the M.S. program, students will be assigned an academic advisor. In consultation with the academic advisor, the student must prepare a Plan of Study outlining the selections that the student will make to satisfy the M.S. degree requirements among the options offered. This Plan of Study must then be approved by the Program's Review Committee, which consists of faculty members from each of the three participating WPI departments.

MS Thesis / Internship (6-9 credits)

A student in the M.S. program must complete at least one of the following two options:

- A 9-credit thesis. The thesis must be advised or co-advised by a faculty member affiliated with the BCB Program.
- A 6-9 credit research or practice-oriented internship. The internship would be carried out in cooperation with a sponsoring organization or affiliated research lab, and must be approved and overseen by a faculty member affiliated with the BCB Program.

Coursework Requirement (24-27 credits)

A student in the M.S. program must take courses to satisfy each of the following four requirements:

- 2 BCB interdisciplinary courses from the list below.
- 3 courses, one in each of the 3 related areas (BBT, CS, MA) from the corresponding lists below.
- 1 graduate course in social implications or bioethics (e.g., CS 505 – Social Implications of Computing, BB 570 – Professional Ethics in the Life Sciences).
- Program electives to satisfy remainder of 33 credit requirement. An elective can be any graduate course listed below. Other graduate courses, graduate research credits, or ISGs
may be used with prior approval of the Program Review Committee.

**Bioinformatics and Computational Biology Interdisciplinary courses:**
- BCB 501 Bioinformatics
- BCB 502 Biovisualization
- BCB 503 Biological and Biomedical Database Mining
- BCB 504 Statistical Methods in Genetics and Bioinformatics

**Relevant Biology & Biotechnology, and Chemistry and Biochemistry Graduate Courses:**
- BB 515 Environmental Change: Problems and Approaches
- BB 565 Virology
- BB 570 Special Topics
- BB 575 Advanced Genetics and Cellular Biology
- CH 540 Regulation of Gene Expression
- CH 554 Molecular Modeling
- CH 561 Functional Genomics

**Relevant Computer Science Graduate Courses:**
- CS5084 Introduction to Algorithms: Design and Analysis
- CS504 Analysis of Computations and Systems
- CS509 Design of Software Systems
- CS531 System Simulation
- CS534 Artificial Intelligence
- CS539 Machine Learning
- CS542 Database Management Systems
- CS561 Advanced Topics in Database Systems
- CS548 Knowledge Discovery and Data Mining
- CS584 Algorithms: Design and Analysis
  (Note: Students cannot receive credit for both CS5084 and CS584.)

**Relevant Mathematics Graduate Courses:**
- MA 509 Stochastic Modeling
- MA 511 Applied Statistics for Engineers and Scientists
- MA 540/4631 Probability and Mathematical Statistics I
- MA 541/4632 Probability and Mathematical Statistics II
- MA 542 Regression Analysis
- MA 546 Design and Analysis of Experiments
- MA 547 Design and Analysis of Observational and Sampling Studies
- MA 549 Analysis of Lifetime Data
- MA 550 Time Series Analysis
- MA 552 Distribution-Free and Robust Statistical Methods
- MA 554 Applied Multivariate Analysis
- MA 556 Applied Bayesian Statistics
Requirements for the B.S./M.S. Degree in Bioinformatics and Computational Biology

Students enrolled in the B.S./M.S. program must satisfy all the program requirements of the B.S. degree and all the program requirements of the M.S. degree. They may count 4000-level courses whose corresponding graduate credit hours total no more than 40% of the 33 credit hours required for the M.S. degree, and that meet all other requirements for each degree, towards both their undergraduate and graduate degrees. The conversion rate between graduate credits and undergraduate units is stated in both the undergraduate and graduate catalogs. Students must register for B.S./M.S. credit prior to taking the courses, as faculty may assign extra work for those taking the course as part of both degrees.

In consultation with the academic advisor, the student must prepare a Plan of Study outlining the selections that the student will make to satisfy the B.S./M.S. degree requirements, including the courses that the student will double count. This Plan of Study must then be approved by the Program's Review Committee. Students must consult their advisors and the graduate catalog as individual departments may have restrictions on which undergraduate courses might be taken for graduate credit, and on which pairs of undergraduate and graduate courses cannot both be taken for credit.