Bioinformatics Major

www.Biology.Pitt.edu/Undergraduate/Academic-Programs or http://CS.Pitt.edu/Undergradsdegrees/Bioinformatics
Revised: 05/2019

Bioinformatics is the theory, application and development of computing tools to solve problems and create hypotheses in all areas of biological sciences. Biology in the post-genome world has and continues to be transformed from a largely laboratory-based science to one integrating experimental and information science. Bioinformatics provides biological tools that handle datasets too large and/or complex for manual analysis. Examples of some of these tools include assembly of DNA sequences of entire genomes, gene finding algorithms, microarray expression analysis, molecular system modeling, and biomarker discovery from mass spectra. Computational tools are central to the organization, analysis, and harvesting of biological data at the level of macromolecules, cells, and systems. Consequently, there is a growing need for trained professionals who understand the languages of both biology and computer science.

The Bioinformatics major is operated jointly by the departments of biological sciences and computer science. This program offers training that builds a solid foundation in chemistry, biology, computer science, mathematics, and statistics. The training will enable students to communicate fluently with experts across these disciplines and to have the skills necessary to apply computing tools to address contemporary problems in biology and medicine. It will enhance the professional opportunities for undergraduates to pursue careers in pure or applied research in academia, government, pharmaceutical, medical, or biotechnology sectors.

Requirements for the Bioinformatics major

Biological Science courses (12 credits)
BIOSC 0150 Foundations of Biology 1
BIOSC 0160 Foundations of Biology 2
BIOSC 0350 Genetics
BIOSC 1540 Computational Biology
BIOSC 1810 Macromolecular Structure & Function

Chemistry courses (6 credits)
CHEM 0310*, CHEM 0320 Organic Chemistry 1, 2
* CHEM 0110 and 0120 are pre-requisites for CHEM 0310.

Computer Science courses (13 credits)
CS 0401 Intermediate Programming using JAVA[**]
CS 0441 Discrete Structures for CS
CS 0445 Data Structures
CS 1501 Algorithm Implementation (W)
[**] Students without a programming background are encouraged to take Introduction to Programming CS 0007 prior to taking CS 0401.

Mathematics courses (11 credits)
MATH 0220 Analytical Geometry & Calculus 1
STAT 1000 Applied Statistical Methods
STAT 1221 Applied Regression

Upper Level courses (3 credits)
BIOSC/CS 1640 Bioinformatics Software Design

Research Courses (4 credits)[*]
BIOSC 1903/CS 1950 Undergraduate Research

* Taken as variable credits over multiple terms as early as sophomore year. Research must be approved by Kirk Pruhs or Paula Grabowski.

Approved Elective courses (12 credits)
Twelve credits chosen in statistics, chemistry, biological sciences, and/or computer science from the following courses. Students may take electives in other departments with approval.

Biological Sciences
Students may take as an elective: BIOSC 0370; BIOSC 0390; or any 1000-level BIOSC course as an elective, excluding: BIOSC 1000, BIOSC 1010; BIOSC 1690; BIOSC 1900-1907.

BIOSC 1903 and BIOSC 1904 count only toward the four research credits. They do not count as elective credits.

If a BIOSC upper-level lab is used as an elective, the prerequisite labs (BIOSC 005X and BIOSC 006X) will be counted for up to three credits.

Chemistry
CHEM 0250 Introduction to Analytical Chemistry
CHEM 1410 Physical Chemistry 1
CHEM 1420 Physical Chemistry 2
CHEM 1460 Computational Drug Discovery
CHEM 1830 Synthetic Biology

Computer Science
Any CS course at the 1500- or 1600-level

Statistics
STAT 1301 Statistical Packages
STAT 1311 Applied Multivariate Analysis
STAT 1321 Applied Time Series

Writing (W) requirement

Students must complete at least one W-course in the major. CS 1501 and CS 1510 are approved writing-intensive courses.

Capstone experience

BIOSC 1640 and CS 1640 satisfy the bioinformatics major capstone experience requirements for graduation. Capstone request must be made to Kirk Pruhs.

Restrictions

Bioinformatics majors who have completed CS 0401 may not enroll in CS 0004, CS 0007 or CS 0110. BIOSC 1000 cannot be substituted for BIOSC 1810. CHEM 1810 can only be substituted for BIOSC 1810 if it is not possible for the student to schedule BIOSC 1810.

Grade requirements

BIOSC courses: A grade of C (not C-) or better is required in each of the core and upper level courses that are to count toward the major. The elective courses for the major must also be completed with a grade of C or better. A minimum GPA of 2.0 in all departmental courses taken is required for graduation. If a C- or lower is earned in an elective course for the major but is not repeated, the course will be used to calculate the overall GPA but will not be counted toward the 32 credits required for the major.

Co-requisite courses

Students must also earn a minimum GPA of 2.0 in the co-requisite Chemistry and Mathematics courses.

Satisfactory/No Credit option

No Bioinformatics major courses may be taken on an S/NC basis.

Advising

Bioinformatics advising is available in both the Department of Biology and the Department of Computer Science. Bioinformatics majors must select an official advisor from either Computer Science or Biological Sciences.

Department of Computer Science

John Ramirez   Kirk Pruhs
6141 Sennott Sq. 6415 Sennott Sq.
412-624-8441   412-624-8844

Advising e-mail: SCIUG@Pitt.edu

The Biological Sciences Departmental Advisors are located in A258 Langley Hall. You are encouraged to stop by to peruse handouts or meet with an advisor even before declaring a major. They love visitors! Students will officially be advised by the Biological Sciences Advising office after declaring a major offered in the department.

Advisors

Available year round
Christine Berliner Kevin Wu
LANGY A258   LANGY A258
412-624-4819   412-624-4273

Available during the academic year
Ellen Kelsey   Jessica Wandelt Dan Wetzel
LANGY A258   LANGY A258   LANGY A258
412-624-0421   412-624-7192   412-648-4286

Advising e-mail: BioAdv@Pitt.edu

Checklist for the Bioinformatics Major

Pre-requisite courses
_____ CS 0007
_____ CHEM 0110
_____ CHEM 0120

Core Courses
_____ BIOSC 0150 or 0715 (UHC)
_____ BIOSC 0160 or BIOSC 0716 (UHC)
_____ BIOSC 0350
_____ BIOSC 1810
_____ CHEM 0310
_____ CHEM 0320
_____ CS 0401
_____ CS 0441
_____ CS 0445
_____ CS 1501 (W option recommended)
_____ MATH 0220
_____ STAT 1000
_____ STAT 1221

Upper Level courses
_____ BIOSC 1540
_____ BIOSC 1640/CS 1640

Research courses
_____ BIOSC 1903/CS 1950 (1 cr.)
_____ BIOSC 1903/CS 1950 (1-2 cr.)
_____ BIOSC 1903/CS 1950 (1cr.)
_____ BIOSC 1903/CS 1950 (1cr.)

Approved Electives
_____ Elective
_____ Elective
_____ Elective
_____ Elective