**BIOINFORMATICS, MASTER OF SCIENCE**

**MS in Bioinformatics**

*Joint Offering with the Whiting School of Engineering for Professionals*

bioinformatics.jhu.edu (https://bioinformatics.jhu.edu)

Johns Hopkins University offers an innovative graduate program that prepares professionals for success in bioinformatics. Drawing from the strengths of the Krieger School of Arts and Sciences and the Whiting School of Engineering, this program fully integrates the computer science, bioscience, and bioinformatics needed to pursue a career in this dynamic field.

The MS in Bioinformatics is designed for working adults, but can be completed full-time. All classes are offered in the evening, on Saturdays, or online. Please note that not every course is available at all on-site locations. The degree can be completed online.

**Admissions Criteria for all Advanced Academic Programs** (https://e-catalogue.jhu.edu/arts-sciences/advanced-academic-programs/enrollment-services/admission/)

**Program Specific Requirements**

Bachelor's degree from an accredited college or university in the biological sciences or in engineering. Programs require a minimum GPA of 3.0 on a 4.0 scale. Meeting the minimum GPA requirement does not guarantee admission.

- All the prerequisites listed below can be taken from the existing Master of Science in Computer Science or the Master of Science in Biotechnology program. Students who have not completed all the prerequisites may be admitted provisionally to complete the admission requirements.
  - Two semesters of organic chemistry (or AS.410.302 Bio-Organic Chemistry)
  - One semester of biochemistry (or AS.410.601 Biochemistry)
  - Introduction to programming using Java, C++, C or Python (or EN.605.201 Introduction to Programming Using Java or EN.605.206 Introduction to Programming Using Python)
  - Data structures (or EN.605.202 Data Structures)
  - One course in probability and statistics (or AS.410.645 Biostatistics)
  - Calculus

- The Admissions Committee reserves the right to request additional information from applicants, such as GRE or letters of recommendation, if needed, to assess their candidacy for admission.

**Program Requirements**

Students take 11 courses to complete the degree—two core required courses, seven core customizable courses, an elective from bioscience, and an elective from computer science. After completion, students may choose an independent study project (optional).

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS.410.602</td>
<td>Molecular Biology</td>
<td>4</td>
</tr>
<tr>
<td>AS.410.610</td>
<td>Epigenetics, Gene Organization &amp; Expression</td>
<td>4</td>
</tr>
<tr>
<td>AS.410.633</td>
<td>Introduction to Bioinformatics</td>
<td>4</td>
</tr>
<tr>
<td>AS.605.620</td>
<td>Algorithms for Bioinformatics</td>
<td>3</td>
</tr>
<tr>
<td>AS.605.621</td>
<td>Foundations of Algorithms</td>
<td>4</td>
</tr>
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**Core Courses - Customizable**

Select four of the following:

- AS.410.635 Bioinformatics: Tools for Genome Analysis
- AS.410.639 Protein Bioinformatics
- AS.410.640 Molecular Phylogenetic Techniques
- AS.410.666 Next Generation DNA Sequencing and Analysis
- AS.410.671 Gene Expression Data Analysis and Visualization
- AS.410.698 Bioperl
- AS.410.712 Advanced Practical Computer Concepts for Bioinformatics
- AS.410.713 Advanced Genomics and Genetics Analyses
- AS.410.734 Practical Introduction to Metagenomics
- AS.410.736 Genomic and Personalized Medicine
- EN.605.643 Linked Data and the Semantic Web
- EN.605.647 Neural Networks
- EN.605.651 Principles of Bioinformatics
- EN.605.653 Computational Genomics
- EN.605.654 Computational Drug Discovery, Dev
- EN.605.657 Statistics for Bioinformatics
- EN.605.716 Modeling and Simulation of Complex Systems
- EN.605.751 Algorithms for Structural Bioinformatics
- EN.605.755 Systems Biology
- EN.705.601 Applied Machine Learning

**Electives**

*Computer Science*

Select one of the following:

- EN.605.601 Foundations of Software Engineering
- EN.605.649 Introduction to Machine Learning
- EN.605.662 Data Visualization
- EN.605.681 Principles of Enterprise Web Development
- EN.605.684 Agile Development with Ruby on Rails
- EN.605.701 Software Systems Engineering
- EN.605.741 Large-Scale Database Systems
- EN.605.746 Advanced Machine Learning
- EN.605.747 Evolutionary and Swarm Intelligence
- EN.605.759 Independent Project in Bioinformatics
- EN.605.788 Big Data Processing Using Hadoop
AS.410.603  Advanced Cell Biology
AS.410.604  Cellular Signal Transduction
AS.410.612  Human Molecular Genetics
AS.410.613  Principles of Immunology
AS.410.615  Microbiology
AS.410.616  Virology
AS.410.622  Molecular Basis of Pharmacology
AS.410.629  Genes & Disease
AS.410.630  Gene Therapy
AS.410.632  Emerging Infectious Diseases
AS.410.638  Cancer Biology
AS.410.641  Clinical & Molecular Diagnostics
AS.410.648  Clinical Trial Design and Conduct
AS.410.656  Recombinant DNA Laboratory
AS.410.752  High Throughput Screening & Automation Lab
AS.410.800  Independent Research in Biotechnology

MS in Bioinformatics with Thesis Option

Students interested in pursuing the MS in Bioinformatics with the thesis are required to take 12 courses. The thesis requires a two-semester research project. Students complete AS.410.800 Independent Research in Biotechnology first and AS.410.801 Biotechnology Thesis the following semester. Students interested in this option should consult with the program advisor.