

# Genomic Medicine BS

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## Overview

Develop a deep understanding of the role of the genomes of humans and pathogens in the development, prevention, and treatment of disease with the **Bachelor of Science in Genomic Medicine**, offered by the Department of Biology. Scientific innovations and technologies allow us to collect genetic information at unprecedented size and scale. At the center of this advancement is the study of the genome. Information from thousands—and soon to be millions—of genomes is revealing the root causes of our genetic and infectious diseases. Due to the growing clinical emphasis on genomic medicine in medical colleges, students in the Genomic Medicine program will acquire a valuable basis for understanding and working with modern biological data. Graduates also gain a foundation in the life sciences that emphasizes the medical relevance of genomics, evolutionary biology, and informatics. This degree will prepare students for growing trends in research and medical careers focused on genomic medicine that use the power of changes in genes, proteins, and next generation technologies to make clinical diagnoses, treat patients, and understand diseases. Additionally, graduates are positioned for careers across multiple research areas, including disease, evolution, genomics, and informatics.

Students may select an **optional** concentration in **Pre-Medicine**.

**Campus Location:** Main

**Program Code:** ST-GCMD-BS

## Distinction in Major

To graduate with distinction in this major, a student must achieve a minimum 3.33 GPA in all the Biology and Chemistry courses required for the major.

## Undergraduate Contact Information

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Learn more about the Bachelor of Science in Genomic Medicine.

*These requirements are for students who matriculated in academic year 2023-2024. Students who matriculated prior to fall 2023 should refer to the Archives to view the requirements for their Bulletin year.*

## Bachelor of Science Requirements

### Summary of Requirements for the Degree

- University Requirements (123 total s.h.)
  - Students must complete all University requirements including those listed below.
  - All undergraduate students must complete at least two writing-intensive courses for a total of at least six credits at Temple as part of their major. The specific writing-intensive course options for this major are:

Code	Title	Credit Hours
BIOL 2297	Research Techniques in Genetics (S)	3
BIOL 3396	Scientific Writing for Biology: The Art of Communicating	3
BIOL 4396	Advanced Study in Biology	3

- Students must complete the General Education (GenEd) requirements.

- See the General Education section of the *Undergraduate Bulletin* for the GenEd curriculum.
- Students who complete CST majors receive a waiver for 2 Science & Technology (GS) and 1 Quantitative Literacy (GQ) GenEd courses.
- Students must satisfy general Temple University residency requirements.

## 2. College Requirements

- A minimum of 90 total credits within the College of Science & Technology (CST), the College of Liberal Arts (CLA), and/or the College of Engineering (ENG).
  - A minimum of 45 of these credits must be upper-level (courses numbered 2000 and above).
- Complete a one-credit first-year or transfer seminar.
  - SCTC 1001 CST First Year Seminar for every entering first-year CST student.
  - SCTC 2001 CST Transfer Seminar for every entering transfer CST student.

## 3. Major Requirements for Bachelor of Science (80-85 s.h.)

At least 9 courses required for the major must be completed at Temple. At least 6 Biology courses must be completed at Temple.

Code	Title	Credit Hours
<b>Biology</b>		
BIOL 1111 or BIOL 1911	Introduction to Organismal Biology Honors Introduction to Organismal Biology	4
Select one of the following:		4
BIOL 1112 or BIOL 1912	Introduction to Biomolecules, Cells and Genomes Honors Introduction to Biomolecules, Cells and Genomes	
BIOL 2112 or BIOL 2912	Introduction to Cellular and Molecular Biology Honors Introduction to Cellular and Molecular Biology	
BIOL 2207	Genetics (S)	3
BIOL 2297	Research Techniques in Genetics (WI, S) <sup>1</sup>	3
BIOL 2512	Genomic Foundations of Medicine (S)	3
BIOL 3101	Evolution (F)	3
BIOL 3112	Fundamentals of Genomic Evolutionary Medicine (S)	3
Select one of the following:		3
BIOL 3396	Scientific Writing for Biology: The Art of Communicating (WI)	
BIOL 4396	Advanced Study in Biology (WI)	
BIOL 3511	Pathophysiology of Genomic Medicine (F)	3
<b>Chemistry</b>		
Select one of the following:		4
CHEM 1031 & CHEM 1033	General Chemistry I and General Chemistry Laboratory I	
CHEM 1951 & CHEM 1953	Honors General Chemical Science I and Honors Chemical Science Laboratory I (F)	
Select one of the following:		4
CHEM 1032 & CHEM 1034	General Chemistry II and General Chemistry Laboratory II	
CHEM 1952 & CHEM 1954	Honors General Chemical Science II and Honors Chemical Science Laboratory II (S)	
Select one of the following:		4
CHEM 2201 & CHEM 2203	Organic Chemistry I and Organic Chemistry Laboratory I	
CHEM 2921 & CHEM 2923	Organic Chemistry for Honors I and Organic Honors Laboratory I (F)	
Select one of the following:		4
CHEM 2202 & CHEM 2204	Organic Chemistry II and Organic Chemistry Laboratory II	
CHEM 2922 & CHEM 2924	Organic Chemistry for Honors II and Organic Honors Laboratory II (S)	
<b>Computer &amp; Information Sciences</b>		
Select one of the following:		4

CIS 1051 or CIS 1951	Introduction to Problem Solving and Programming in Python Honors Introduction to Problem Solving and Programming in Python
CIS 1057	Computer Programming in C
CIS 1068 or CIS 1968	Program Design and Abstraction Honors Program Design and Abstraction

**Genomic Medicine Electives**Select five of the following.<sup>2, 3</sup>

15-20

BIOL 2233	Mammalian Anatomy (F)
BIOL 3111	Genomics in Medicine (F)
BIOL 3128	Genomics and Infectious Disease Dynamics (F)
BIOL 3201	Human Genetics (F)
BIOL 3204	Cell Structure and Function (F)
BIOL 3211	Human Evolution
BIOL 3212	Introduction to Bioinformatics and Computational Biology
BIOL 3225	Evolutionary Genetics (S)
BIOL 3232	Behavioral Genetics (F)
BIOL 3241	Genomics and Evolutionary Biology of Parasites and Other Dependent Species (S)
BIOL 3243	Parasitology
BIOL 3265	Developmental Biology (F)
BIOL 3301	Advanced Cell Biology (F)
BIOL 3312	Biostatistics (F)
BIOL 3317	General Microbiology (S)
BIOL 3324	Molecular Biology (F)
BIOL 3325	Research Techniques in Molecular Biology (S)
BIOL 3327	Immunology (S)
BIOL 3328	Virology (F)
BIOL 3329	Developmental Genetics
BIOL 3334	Mammalian Physiology (S)
BIOL 3352	Systems Neuroscience
BIOL 3356	Organization and Development of the Nervous System (S)
BIOL 3358	Cellular and Molecular Neuroscience (S)
BIOL 3361	Molecular Neuropharmacology
BIOL 3363	Mammalian Development
BIOL 3367	Endocrinology (F)
BIOL 3368	Biology of Cancer (S)
BIOL 3371	Cell Proliferation (S)
BIOL 3373	Cell Signaling (S)
BIOL 3374	Physical Biochemistry (S)
BIOL 3380	Contemporary Biology
BIOL 3403	Genomic Biology
BIOL 4338	Epigenetics
BIOL 4344	Research Techniques in Biochemistry (S)
BIOL 4364	Biochemistry of Embryogenesis (F)
BIOL 4365	Evolutionary Developmental Biology: Evo-Devo (S)
BIOL 4366	Stem Cell Biology (F)
BIOL 4375	General Biochemistry I (F)
BIOL 4376	General Biochemistry II (F)
CHEM 3401	Applications of Biochemistry
CIS 2168	Data Structures
CIS 2109	Database Management Systems
CIS 3715	Principles of Data Science (S)
CIS 4523	Knowledge Discovery and Data Mining

MATH 3031	Probability Theory I
MATH 3032	Mathematical Statistics (S)
MATH 4033	Probability Theory II (F)

**Mathematics**

Select one of the following: 4

MATH 1041	Calculus I
MATH 1941	Honors Calculus I

Select one of the following: 4

MATH 1042	Calculus II
MATH 1942	Honors Calculus II
MATH 1044	Introduction to Probability and Statistics for the Life Sciences

**Physics**

Select one of the following: 4

PHYS 1021	Introduction to General Physics I
PHYS 1061	Elementary Classical Physics I
or PHYS 1961	Honors Elementary Classical Physics I
PHYS 2021	General Physics I
or PHYS 2921	Honors General Physics I

Select one of the following: 4

PHYS 1022	Introduction to General Physics II
PHYS 1062	Elementary Classical Physics II
or PHYS 1962	Honors Elementary Classical Physics II
PHYS 2022	General Physics II
or PHYS 2922	Honors General Physics II

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**Total Credit Hours** **80-85**

Code	Title	Credit Hours
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(F) - Fall only course

(S) - Spring only course

1

This course has a co-requisite of BIOL 2207.

2

Additional course prerequisites may be required.

3

Students may fulfill one upper-level elective by completing a total of 6 credits of research. A maximum of 3 credits may come from the junior level research course BIOL 3082 and the remaining 3 credits must come from a senior level (**4000+**) research course. Students may also complete all 6 credits using a two semesters of the senior research course if they prefer. Consult with your departmental advisor to determine which course(s) are appropriate. Once completed, students must seek approval from a CST advisor to obtain the waiver for credit towards one upper-level elective.

With the exception noted in footnote 3 above, the research and independent study courses shown below do not count as Genomic Medicine electives, but they may count as free elective credits toward graduation. Most research courses can only be taken ONCE for a letter grade. Check individual course descriptions for details and/or exceptions.

Code	Title	Credit Hours
BIOL 2082	Independent Research I	1 to 4
BIOL 3082	Independent Research II	1 to 4
BIOL 3181	Cooperative Research in Biochemistry	3
BIOL 3681	Cooperative Studies	2 to 4
BIOL 3685	Externship Studies	3
BIOL 4291	Extrdepartmental Research	1 to 4
BIOL 4391	Accelerated Research in Biology	1 to 4

BIOL 4483	Accelerated Research in Biochemistry	3
BIOL 4491	Research in Biochemistry	3
BIOL 4591	Research in Neuroscience	1 to 4

**Note:** Grades of C- or higher are required unless otherwise specified in all courses for the major, including course prerequisites. The College of Science and Technology requires that students have a GPA of at least 2.00 overall and at least 2.00 in the courses applicable to their major and/or minor GPA to graduate.

## Suggested Academic Plan

### Bachelor of Science in Genomic Medicine

#### Suggested Plan for New Students Starting in the 2023-2024 Academic Year

Year 1		Credit Hours
<b>Fall</b>		
BIOL 1111 or BIOL 1911	Introduction to Organismal Biology or Honors Introduction to Organismal Biology	4
MATH 1041 or MATH 1941	Calculus I or Honors Calculus I	4
SCTC 1001	CST First Year Seminar	1
Select one of the following:		4
CIS 1051 or CIS 1951	Introduction to Problem Solving and Programming in Python or Honors Introduction to Problem Solving and Programming in Python	
CIS 1057	Computer Programming in C	
CIS 1068 or CIS 1968	Program Design and Abstraction or Honors Program Design and Abstraction	
ENG 0802 or ENG 0812 or ENG 0902	Analytical Reading and Writing or Analytical Reading and Writing: ESL or Honors Writing About Literature	4
<b>Credit Hours</b>		<b>17</b>
<b>Spring</b>		
Select one of the following:		4
BIOL 1112 or BIOL 1912	Introduction to Biomolecules, Cells and Genomes or Honors Introduction to Biomolecules, Cells and Genomes	
BIOL 2112 or BIOL 2912	Introduction to Cellular and Molecular Biology or Honors Introduction to Cellular and Molecular Biology	
Select one of the following:		4
CHEM 1031 & CHEM 1033	General Chemistry I and General Chemistry Laboratory I	
CHEM 1951 & CHEM 1953	Honors General Chemical Science I and Honors Chemical Science Laboratory I	
Select one of the following:		4
MATH 1042 or MATH 1942	Calculus II or Honors Calculus II	
MATH 1044	Introduction to Probability and Statistics for the Life Sciences	
IH 0851 or IH 0951	Intellectual Heritage I: The Good Life or Honors Intellectual Heritage I: The Good Life	3
<b>Credit Hours</b>		<b>15</b>
<b>Year 2</b>		
<b>Fall</b>		
BIOL 3101	Evolution ((F))	3
Select one of the following:		4
CHEM 1032 & CHEM 1034	General Chemistry II and General Chemistry Laboratory II	
CHEM 1952 & CHEM 1954	Honors General Chemical Science II and Honors Chemical Science Laboratory II	

IH 0852 or IH 0952	Intellectual Heritage II: The Common Good or Honors Intellectual Heritage II: The Common Good	3
GenEd Breadth Elective		3
Elective		3
<b>Credit Hours</b>		<b>16</b>
<b>Spring</b>		
BIOL 2207	Genetics (S)	3
BIOL 2297	Research Techniques in Genetics ((S))	3
BIOL 2512	Genomic Foundations of Medicine (S)	3
Select one of the following:		4
CHEM 2201 & CHEM 2203	Organic Chemistry I and Organic Chemistry Laboratory I	
CHEM 2921 & CHEM 2923	Organic Chemistry for Honors I and Organic Honors Laboratory I	
Elective		2
<b>Credit Hours</b>		<b>15</b>
<b>Year 3</b>		
<b>Fall</b>		
BIOL 3511	Pathophysiology of Genomic Medicine (F)	3
Select one of the following:		4
CHEM 2202 & CHEM 2204	Organic Chemistry II and Organic Chemistry Laboratory II	
CHEM 2922 & CHEM 2924	Organic Chemistry for Honors II and Organic Honors Laboratory II	
Select one of the following:		4
PHYS 1021	Introduction to General Physics I	
PHYS 1061 or PHYS 1961	Elementary Classical Physics I or Honors Elementary Classical Physics I	
PHYS 2021 or PHYS 2921	General Physics I or Honors General Physics I	
Elective		3
<b>Credit Hours</b>		<b>14</b>
<b>Spring</b>		
BIOL 3112	Fundamentals of Genomic Evolutionary Medicine (S)	3
Genomic Medicine Elective <sup>1</sup>		3-4
Select one of the following:		4
PHYS 1022	Introduction to General Physics II	
PHYS 1062 or PHYS 1962	Elementary Classical Physics II or Honors Elementary Classical Physics II	
PHYS 2022 or PHYS 2922	General Physics II or Honors General Physics II	
GenEd Breadth Course		3
Elective		3-2
<b>Credit Hours</b>		<b>16</b>
<b>Year 4</b>		
<b>Fall</b>		
Genomic Medicine Elective <sup>1</sup>		3-4
Genomic Medicine Elective <sup>1</sup>		3-4
Genomic Medicine Elective <sup>1</sup>		3-4
GenEd Breadth Course		3
Elective		3-0
<b>Credit Hours</b>		<b>15</b>

**Spring**

Genomic Medicine Elective <sup>1</sup>		3-4
Select one of the following:		3
BIOL 3396	Scientific Writing for Biology: The Art of Communicating	
BIOL 4396	Advanced Study in Biology	
GenEd Breadth Course		3
GenEd Breadth Course		3-4
Elective		3-1
	<b>Credit Hours</b>	<b>15</b>
	<b>Total Credit Hours</b>	<b>123</b>

<b>Code</b>	<b>Title</b>	<b>Credit Hours</b>
(F) - Fall only course		
(S) - Spring only course		

1

See the Genome Medicine Electives list under Requirements for course options.