Data Science BS with Genomics and Bioinformatics Concentration

Overview

Science and technology are the foundations of our future. The Department of Computer and Information Sciences (CIS) is focused on the understanding of fundamental scientific principles and the application of these principles to solving complex problems, using computing technology.

Data Science is an interdisciplinary field of study about methods and systems to extract knowledge or insights from large quantities of data coming in various forms. The **Bachelor of Science in Data Science** is designed for students interested in developing expertise in data science.

Data Science students **must select one of the following concentrations**:

- Computation and Modeling
- Computational Analytics
- Genomics and Bioinformatics

The **Concentration in Genomics and Bioinformatics** provides a strong background in mathematics, computational thinking and biological data analysis, and will enable students to analyze large quantities of data to discover new knowledge and facilitate decision making. This specialization is intended for students interested in biology, ecology, evolution, human health and disease, and precision medicine. Over the past decade, the emergence of next-generation sequencing technologies has facilitated the rapid growth of genomic data; however, undergraduate training in big data management, big data processing and big data analysis has not kept up with this rapid growth in large-scale biological data generation.

Campus Location: Main

Program Code: ST-DTSC-BS

Distinction in Major

To graduate with distinction in this major, a student must satisfy the following criteria:

- achieve a minimum 3.5 cumulative GPA and
- achieve a minimum 3.5 major GPA.

Accelerated Programs

Accelerated programs provide a pathway for students to pursue both an undergraduate degree and an advanced degree in a shorter amount of time. Below is a list of available accelerated programs for students in the BS in Data Science.

- BS in Data Science / MS in Computational Data Science

Undergraduate Contact Information

Jamie Payton, Chair
Science, Education and Research Center, Room 304
215-204-8450

Gene Kwatny, Vice Chair
Science, Education and Research Center, Room 304
215-204-8450

Andrew Rosen, Faculty Advisor
Science, Education and Research Center, Room 349
215-204-3193
andrew.rosen@temple.edu

Caryn Babaian, Faculty Advisor
Science, Education and Research Center, Room 602
215-204-1814
caryn.babaian@temple.edu

Sudhir Kumar, Program Director
Science, Education and Research Center, Room 601A
215-204-1647

s.kumar@temple.edu

Learn more about the Bachelor of Science in Data Science.

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

1. 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) [1]	3
CIS 4496	Projects in Data Science	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 (82 s.h.)

   At least 9 courses required for the major must be completed at Temple. At least 3 CIS courses must be completed at Temple.

Code	Title	Credit Hours
Introductory Science Requirements		
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
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	
Calculus Requirements		
MATH 1041	Calculus I	4
or MATH 1941	Honors Calculus I	
MATH 1042	Calculus II	4
or MATH 1942	Honors Calculus II	
Math Methods in Computing Requirements		
CIS 1166	Mathematical Concepts in Computing I	4
or CIS 1966	Honors Mathematical Concepts in Computing I	
CIS 2166	Mathematical Concepts in Computing II	4
Probability and Statistics Requirements		
MATH 3031	Probability Theory I	3
MATH 3032	Mathematical Statistics	3

Programming Requirements

CIS 1068	Program Design and Abstraction	4
or CIS 1968	Honors Program Design and Abstraction	
CIS 2168	Data Structures	4
Common Specialty Course Requirements		
CIS 3715	Principles of Data Science	4
CIS 4496	Projects in Data Science	3
Concentration Requirements		
BIOL 1111	Introduction to Organismal Biology	4
or BIOL 1911	Honors Introduction to Organismal Biology	
BIOL 2112	Introduction to Cellular and Molecular Biology	4
or BIOL 2912	Honors Introduction to Cellular and Molecular Biology	
BIOL 2207	Genetics (S)	3
BIOL 2297	Research Techniques in Genetics (WI, S) [1]	3
BIOL 3101	Evolution	3
BIOL 3111	Genomics in Medicine	3
Select one of the following:		4
CHEM 2201 & CHEM 2203	Organic Chemistry I and Organic Chemistry Laboratory I	
CHEM 2211 & CHEM 2213	Organic Chemistry for Majors I and Organic Majors Laboratory I	
CHEM 2921 & CHEM 2923	Organic Chemistry for Honors I and Organic Honors Laboratory I	
Select one of the following:		4
CHEM 2202 & CHEM 2204	Organic Chemistry II and Organic Chemistry Laboratory II	
CHEM 2212 & CHEM 2214	Organic Chemistry for Majors II and Organic Majors Laboratory II	
CHEM 2922 & CHEM 2924	Organic Chemistry for Honors II and Organic Honors Laboratory II	
Genomics and Bioinformatics Elective Requirements		
Select from the following list:		9
BIOL 2227	Principles of Ecology	
BIOL 3112	Fundamentals of Genomic Evolutionary Medicine	
BIOL 3114	Evolutionary Ecology	
BIOL 3128	Genomics and Infectious Disease Dynamics	
BIOL 3201	Human Genetics	
BIOL 3211	Human Evolution	
BIOL 3225	Evolutionary Genetics	
BIOL 3241	Genomics and Evolutionary Biology of Parasites and Other Dependent Species	
BIOL 3321	Plant Community Ecology [2]	
BIOL 3322	Biology of Plants	
BIOL 3324	Molecular Biology [3]	
BIOL 3328	Virology [3]	
BIOL 3368	Biology of Cancer [3]	
BIOL 3379	Biotechnology [3]	
BIOL 3403	Genomic Biology [3]	
CEE 3048	Probability, Statistics & Stochastic Methods	
CIS 4523	Knowledge Discovery and Data Mining	
or CIS 5523	Knowledge Discovery and Data Mining	
Total Credit Hours		**82**

1

This course has a co-requisite of BIOL 2207.

2

This course requires an additional prerequisite of BIOL 2227.

3

This course requires an additional prerequisite of BIOL 3204.

Suggested Academic Plan

Bachelor of Science in Data Science with Concentration in Genomics and Bioinformatics

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

Year 1		
Fall		**Credit Hours**

CIS 1068
    or CIS 1968
	Program Design and Abstraction
	        or Honors Program Design and Abstraction
		4

MATH 1041
    or MATH 1941
	Calculus I
	        or Honors Calculus I
		4

SCTC 1001	CST First Year Seminar	1

ENG 0802
    or ENG 0812
    or ENG 0902
	Analytical Reading and Writing
	        or Analytical Reading and Writing: ESL
	        or Honors Writing About Literature
		4

Elective		2
	Credit Hours	**15**
Spring		

CIS 1166
    or CIS 1966
	Mathematical Concepts in Computing I
	        or Honors Mathematical Concepts in Computing I
		4

MATH 1042
    or MATH 1942
	Calculus II
	        or Honors Calculus II
		4

IH 0851
    or IH 0951
	Intellectual Heritage I: The Good Life
	        or Honors Intellectual Heritage I: The Good Life
		3

Elective		4
	Credit Hours	**15**
Year 2		
Fall		

CHEM 1031
    or CHEM 1951
	General Chemistry I
	        or Honors General Chemical Science I
		3

CHEM 1033
    or CHEM 1953
	General Chemistry Laboratory I
	        or Honors Chemical Science Laboratory I
		1

CIS 2166	Mathematical Concepts in Computing II	4
CIS 2168	Data Structures	4

IH 0852
    or IH 0952
	Intellectual Heritage II: The Common Good
	        or Honors Intellectual Heritage II: The Common Good
		3

Elective		1
	Credit Hours	**16**
Spring		

BIOL 1111
    or BIOL 1911
	Introduction to Organismal Biology
	        or Honors Introduction to Organismal Biology
		4

CHEM 1032
    or CHEM 1952
	General Chemistry II
	        or Honors General Chemical Science II
		3

CHEM 1034
    or CHEM 1954
	General Chemistry Laboratory II
	        or Honors Chemical Science Laboratory II
		1

CIS 3715	Principles of Data Science (S)	4
GenEd Breadth Course		3
	Credit Hours	**15**

Year 3		
Fall		
BIOL 2112	Introduction to Cellular and Molecular Biology	4
or BIOL 2912	or Honors Introduction to Cellular and Molecular Biology	
MATH 3031	Probability Theory I	3
Select one of the following:		4
CHEM 2201 & CHEM 2203	Organic Chemistry I and Organic Chemistry Laboratory I	
CHEM 2211 & CHEM 2213	Organic Chemistry for Majors I and Organic Majors Laboratory I	
CHEM 2921 & CHEM 2923	Organic Chemistry for Honors I and Organic Honors Laboratory I	
GenEd Breadth Course		3
Elective		2
	Credit Hours	**16**
Spring		
BIOL 2207	Genetics ((S))	3
BIOL 2297	Research Techniques in Genetics ((S))	3
MATH 3032	Mathematical Statistics (S)	3
Select one of the following:		4
CHEM 2202 & CHEM 2204	Organic Chemistry II and Organic Chemistry Laboratory II	
CHEM 2212 & CHEM 2214	Organic Chemistry for Majors II and Organic Majors Laboratory II	
CHEM 2922 & CHEM 2924	Organic Chemistry for Honors II and Organic Honors Laboratory II	
GenEd Breadth Course		3
	Credit Hours	**16**
Year 4		
Fall		
BIOL 3101	Evolution (F)	3
BIOL 3111	Genomics in Medicine (F)	3
Data Science: Genomics & Bioinformatics Elective		3
Data Science: Genomics & Bioinformatics Elective		3
GenEd Breadth Course		3
	Credit Hours	**15**
Spring		
CIS 4496	Projects in Data Science	3
Data Science: Genomics & Bioinformatics Elective		3
GenEd Breadth Course		3-4
Elective		6-5
	Credit Hours	**15**
	Total Credit Hours	**123**

Code	Title	Credit Hours
(F) - Fall only course		
(S) - Spring only course		