Data Science with Concentration in Computational Analytics, B.S.

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. Temple's B.S. in Data Science is designed for students interested in developing expertise in data science. The Computational Analytics concentration provides a strong background in mathematics, algorithmic and computational thinking, computer systems, and data analysis, and will enable students to analyze large quantities of data to discover new knowledge and facilitate decision making.

Undergraduate Contact Information

Dr. Slobodan Vucetic, Chair
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215-204-8450

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

Dr. Anthony Hughes, Faculty Advisor
Science Education and Research Center, Room 344
215-204-7910
anthony.hughes@temple.edu

Bachelor of Science

Summary of Requirements for the Degree

1. University Requirements (123 total s.h.)
   • MATH 0701 (4 s.h.) and/or ENG 0701 (4 s.h.), if required by placement testing.
   • All Temple students must take a minimum of two writing-intensive courses at Temple as part of their major: ENG 2696 and SCTC xx96.
   • Students must complete the General Education (GenEd) requirements.
     • See the General Education (http://bulletin.temple.edu/undergraduate/general-education) section of the Undergraduate Bulletin for the GenEd curriculum.
     • Students who complete CST majors typically receive a waiver for 2 Science & Technology (GS) and 1 Quantitative Literacy (GQ) GenEd courses.
     • Students must satisfy general Temple University residency requirements (http://bulletin.temple.edu/undergraduate/academic-policies/academic-residency-requirements).

2. College Requirements
   • 45 Upper Level (2000+) credits within the College of Science & Technology (CST) or the College of Liberal Arts (CLA).
   • 90 credits within the College of Science & Technology (CST) or the College of Liberal Arts (CLA).

3. Major Requirements for Bachelor of Science (81-82 s.h.)
   At least 9 courses required for the major must be completed at Temple. At least 7 CIS courses must be completed at Temple.

<table>
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<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>CHEM 1031</td>
<td>General Chemistry I</td>
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<tr>
<td>&amp; CHEM 1032</td>
<td>and General Chemistry II</td>
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<td>&amp; CHEM 1033</td>
<td>and General Chemistry Laboratory I</td>
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<tr>
<td>&amp; CHEM 1034</td>
<td>and General Chemistry Laboratory II</td>
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<tr>
<td>&amp; CHEM 1952</td>
<td>and Honors General Chemical Science II</td>
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<tr>
<td>&amp; CHEM 1953</td>
<td>and Honors Chemical Science Laboratory I</td>
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</tr>
<tr>
<td>&amp; CHEM 1954</td>
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<tr>
<td>PHYS 1061</td>
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<tr>
<td>&amp; PHYS 1062</td>
<td>and Elementary Classical Physics II</td>
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PHYS 1961 & PHYS 1962
Honors Elementary Classical Physics I and Honors Elementary Classical Physics II

PHYS 2021 & PHYS 2022
General Physics I and General Physics II

PHYS 2921 & PHYS 2922
Honors General Physics I and Honors General Physics II

**Calculus Requirements**

MATH 1041
Calculus I
or MATH 1941
Honors Calculus I

MATH 1042
Calculus II
or MATH 1942
Honors Calculus II

**Math Methods in Computing Requirements**

CIS 1166
Mathematical Concepts in Computing I

CIS 2166
Mathematical Concepts in Computing II

**Probability and Statistics Requirements**

MATH 3031
Probability Theory I

MATH 3032
Mathematical Statistics

**Programming Requirements**

CIS 1068
Program Design and Abstraction

CIS 2168
Data Structures

**Common Specialty Course Requirements**

CIS 3715
Principles of Data Science

SCTC xx96
(Advanced Data Visualization)

**Concentration Requirements**

CIS 2107
Computer Systems and Low-Level Programming

CIS 3223
Data Structures and Algorithms

CIS 4331
Principles of Database Systems

CIS 4517
Data-Intensive and Cloud Computing

CIS 4526
Foundations of Machine Learning

ENG 2696
Technical Writing

MATH 2043
Calculus III

or MATH 2943
Honors Calculus III

Select one of the following:

MATH 3045
Differential Equations with Linear Algebra

MATH 2101
Linear Algebra

MATH 2103
Linear Algebra with Computer Lab

**Computational Analytics Elective Requirements**

Select from the following list:

BIOE 3301
Biomedical Signals and Systems

CEE 3048
Probability, Statistics & Stochastic Methods

CEE 3711
Environmental Engineering

CEE 4221
Intelligent Transportation Systems

CEE 4531
Life Cycle Assessment and Carbon Footprinting

CIS 3203
Introduction to Artificial Intelligence

CIS 3207
Introduction to Systems Programming and Operating Systems

CIS 3219
Computer Graphics and Image Processing

CIS 3515
Introduction to Mobile Application Development

CIS 3605
Introduction to Digital Forensics

CIS 4523
Knowledge Discovery and Data Mining

or CIS 5523
Knowledge Discovery and Data Mining

CIS 4524
Analysis and Modeling of Social and Information Networks

EES 3011
Remote Sensing and GIS

HCM 3501
Introduction to Health Services Systems
### Calculation of Major GPA

Courses listed under the major requirements for the degree will be included in the calculation of the major GPA. Courses that could not apply toward the major as an elective or a required course are not counted in the calculation of the major GPA.

### Distinction in Major

To graduate with Distinction in Major, students are required to have a 3.50 or higher grade point average (GPA) both in the major and overall, as well as be recommended by the department of Computer & Information Sciences.

### Suggested Academic Plan

**Bachelor of Science in Data Science with Concentration in Computational Analytics**

**Requirements for New Students starting in the 2018-2019 Academic Year**

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Fall</th>
<th>Credit Hours</th>
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<tr>
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<td>General Education/Elective Credits</td>
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<td></td>
<td>Spring</td>
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<tr>
<td></td>
<td>CIS 1166 or 1966</td>
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<tr>
<td></td>
<td>MATH 1042 or 1942</td>
<td>4</td>
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<th>Year 2</th>
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<tr>
<td></td>
<td>CIS 2166</td>
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<tr>
<td></td>
<td>CIS 2168</td>
<td>4</td>
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<tr>
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<td>MATH 2043 or 2943</td>
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<td>Select one of the following Chemistry or Physics sequences:</td>
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<tr>
<td></td>
<td>CHEM 1031 &amp; CHEM 1033</td>
<td>General Chemistry I</td>
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<td></td>
<td>PHYS 2021 &amp; PHYS 2921</td>
<td>Honors General Physics I</td>
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<tr>
<td></td>
<td><strong>Term Credit Hours</strong></td>
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<th>Spring</th>
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<tbody>
<tr>
<td></td>
<td>CIS 2107</td>
<td>4</td>
</tr>
<tr>
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<td>Computer Systems and Low-Level Programming</td>
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</tbody>
</table>
## Year 3

### Fall
- CIS 4331 Principles of Database Systems (F) **4**
- MATH 3031 Probability Theory I **3**
- Select one of the following: **3-4**
  - MATH 3045 Differential Equations with Linear Algebra (F)
  - MATH 2101 Linear Algebra
  - MATH 2103 Linear Algebra with Computer Lab (F)

### General Education/Elective Credits **6-5**

### Term Credit Hours **15**

### Spring
- CIS 4517 Data-Intensive and Cloud Computing (S) **3**
- MATH 3032 Mathematical Statistics (S) **3**

### General Education/Elective Credits **9**

### Term Credit Hours **16**

## Year 4

### Fall
- CIS 4526 Foundations of Machine Learning (F) **3**
- Data Science: Computational Analytics Elective **3**
- Data Science: Computational Analytics Elective **3**
- General Education/Elective Credits **7**

### Term Credit Hours **15**

### Spring
- SCTC xx96 (S) **3**
- ENG 2696 Technical Writing [WI] **3**
- Data Science: Computational Analytics Elective **3**

### General Education/Elective Credits **6**

### Term Credit Hours **15**

### Total Credit Hours **123**

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<td>(S) - Spring only course</td>
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