DATA SCIENCE (BS)

Program Description

As society becomes increasingly dependent on data, new knowledge, skills, and professions are emerging to collect, organize, interpret, and use data. Data science is the study of data, using tools from statistics, computer science, and mathematics to extract useful information from data to make informed decisions. Data science is used in nearly every professional domain, including business and government, finance, medicine and health sciences, social services, science, education, and more.

At SPU, students learn data science by actively engaging with data – class time is spent primarily on collaborative problem-solving and exploration of data rather than lecture. Enriched by SPU's broad Christian liberal arts curriculum, students also explore ethical and social considerations that are inherent in data science, particularly when working with sensitive personal information. As a graduate of SPU's data science program, you will have a firm grounding in the mathematical and statistical foundations of data science along with skills in multiple programming languages. You will be prepared to manage the full data workflow, from data acquisition and cleaning to exploration, analysis, modeling, visualization, and communication of final results.

SPU also offers a Master of Science in Data Analytics (https://catalog.spu.edu/graduate/college-schools/college-business-technology/data-analytics-business-ms/). There is an accelerated 4+1 Pathway (https://catalog.spu.edu/undergraduate/college-schools/cbt-technology/#4_1) that allows high-achieving students to earn both a Bachelor of Science in Data Science (p. 1) and a Master of Science in Data Analytics (https://catalog.spu.edu/graduate/college-schools/college-business-technology/data-analytics-business-ms/) in just five years.

Learning objectives for students completing the B.S. in Data Science include:

1. **Data analysis:** Graduates will be able to analyze data using mathematical, statistical, and computational tools to solve real-world problems.
2. **Data management:** Graduates will be able to acquire, clean, organize, and manage data from a variety of sources and document processes used to ensure reproducibility of analyses.
3. **Technological tools:** Graduates will develop proficiency with relevant technological tools for analyzing and managing data, including multiple programming languages.
4. **Communication:** Graduates will be able to effectively communicate results of data analyses in written, verbal, and graphical presentations.
5. **Ethical considerations:** Graduates will be able to identify and evaluate social, ethical, and theological implications of data science projects.

Entering and Completing the Major

In order to earn a degree, you must complete at least one academic major. SPU encourages students to explore various academic paths, so if you change your mind about a major, or want to include an additional program, you are able to do so, as outlined below.

Note that the University encourages you to enter your chosen major(s) as soon as you have determined it and are eligible to join it, especially by the start of your junior year. Students who transfer as juniors and seniors should enter a major within their first two quarters at SPU.

- If this is your first quarter at SPU and you identified a major in this department as your first choice on your application for admission to the University, you have gained entry to the major. To change or add a major, follow these instructions (https://spu.atlassian.net/l/cp/a3th1keb).
- If you are an SPU student with an SPU cumulative GPA of 2.0 or better, follow these instructions (https://spu.atlassian.net/l/cp/a3th1keb) to enter a major in this department.
- The University requires a grade of C- or better in all classes that apply to a major; however, programs may require higher minimum grades in specific courses. You may repeat an SPU course only once for a higher grade.
- To advance in this program, meet with your faculty advisor regularly to discuss your grades, course progression, and other indicators of satisfactory academic progress. If your grades or other factors indicate that you may not be able to successfully complete the major or minor, your faculty advisor can work with you to explore options, which may include choosing a different major.
- You must complete the major requirements that are in effect in the SPU Undergraduate Catalog for the year you enter the major.

Data Science (BS)

95 Credits Minimum, Including 44 Upper Division (UD)

Code	Title	Credits
Data Science Core		
MAT 2360	Introduction to Statistics for the Sciences (Ways of Knowing Quantitative Reasoning (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/exploratory-curriculum/#wkqrtext))	5
MAT 3333	Statistical Modeling	5
DAT 3380	Introduction to Data Science	5
DAT 3381	Data Science II	5
DAT 4380	Introduction to Machine Learning	5
DAT 4500	Data and Society	5
Section Credits Required		30
Mathematics Foundations		
MAT 1234	Calculus I (Ways of Knowing Quantitative Reasoning (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/exploratory-curriculum/#wkqrtext))	5
MAT 1235	Calculus II	5
MAT 1236	Calculus III	5
MAT 1720	Mathematics for Computer Science	5
MAT 2401	Linear Algebra	3
MAT 3360	Probability and Statistics	5
Section Credits Required		28
Computer Science Core		
CSC 1250	Introductory Problem Solving and Programming (Ways of Knowing in the Sciences (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/exploratory-curriculum/#wksciencestext))	5

CSC 1260	Structured Programming (Ways of Knowing in the Sciences (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/exploratory-curriculum/#wksciencestext))	5
CSC 2430	Object Oriented Programming	5
CSC 2431	Data Structures and Algorithms	5
CSC 4410	Database Systems	5
Section Credits Required		25
Ethics and Technology		
CSC 3011	Living in a Digital World	3
PHI 2500	Science, Technology and Society	3
Section Credits Required		6
Electives: Select Two of the Following:		
BUS 4650	Data Analytics and Visualization	
CSC 3430	Algorithm Design and Analysis	
CSC 4250	Introduction to Artificial Intelligence	
MAT 3237	Differential Equations	
MAT 4363	Mathematical Statistics	
MAT 4725	Numerical Analysis	
MAT 4830	Mathematical Modeling	
Section Credits Required		6
Total Credits		**95**

Suggested Course Sequence

Two suggested course sequences are shown below: a four-year plan for students entering SPU as freshman and a two-year plan for transfer students entering SPU with a DTA Associates Degree. Individual student plans may vary somewhat from these examples, and the specific times and quarters when courses are offered may vary from year to year. All students should consult with a faculty advisor to construct an individualized plan that meets their needs and interests.

Four-Year Plan

The plan below is a suggested four year course sequence for students entering as freshmen ready to enter the calculus sequence in their first quarter. Some adjustments will be needed for students who need precalculus prior to taking calculus.

Course	Title	Credits
Freshman		
Autumn		
FYS 1000	First Year Seminar	3
MAT 1234	Calculus I (Ways of Knowing Quantitative Reasoning (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/exploratory-curriculum/#wkqrtext))	5
	Credits	**8**
Winter		
MAT 1235	Calculus II	5
	Credits	**5**
Winter or Spring		
MAT 2360	Introduction to Statistics for the Sciences (Ways of Knowing Quantitative Reasoning (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/exploratory-curriculum/#wkqrtext))	5
	Credits	**5**
Spring		
MAT 1236	Calculus III	5
	Credits	**5**
Any Quarter		
TCOR 1000	The Christian Faith (Common Curriculum (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/common-curriculum/))	5
WRI 1000	Academic Inquiry and Writing Seminar (Academic Inquiry and Writing (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/common-curriculum/#academicwritingtext))	5
Ways of Knowing in the Humanities (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/exploratory-curriculum/#wkhtext) or Ways of Knowing in the Social Sciences (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/exploratory-curriculum/#wksstext) or Ways of Knowing in the Arts (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/exploratory-curriculum/#wkatext) [1]		10-15
	Credits	**20-25**
Sophomore		
Autumn		
CSC 1250	Introductory Problem Solving and Programming (Ways of Knowing in the Sciences (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/exploratory-curriculum/#wksciencestext))	5
MAT 3333	Statistical Modeling	5
TCOR 2000 or UCOR 2100	Christian Scripture or World History, Faith, and Reconciliation	5
	Credits	**15**
Winter		
CSC 1260	Structured Programming (Ways of Knowing in the Sciences (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/exploratory-curriculum/#wksciencestext))	5
DAT 3380	Introduction to Data Science	5
MAT 1720	Mathematics for Computer Science	5
	Credits	**15**
Spring		
CSC 2430	Object Oriented Programming	5
DAT 3381	Data Science II	5
UCOR 2100 or TCOR 2000	World History, Faith, and Reconciliation or Christian Scripture	5
	Credits	**15**
Junior		
Autumn		
MAT 2401	Linear Algebra	3
TCOR 3100 or UCOR 3000	Christian Theology or Faith, Philosophy, and Science	5
PHI 2500	Science, Technology and Society	3
	Credits	**11**
Winter		
CSC 2431	Data Structures and Algorithms	5
DAT 4380 or MAT 3360	Introduction to Machine Learning [2] or Probability and Statistics	5
	Credits	**10**
Spring		
BUS 4650	Data Analytics and Visualization	5
UCOR 3000 or TCOR 3100	Faith, Philosophy, and Science or Christian Theology	5
	Credits	**10**
Senior		
Autumn		
CSC 4410	Database Systems	5
	Credits	**5**

Winter		
CSC 3011	Living in a Digital World (Ways of Engaging (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/exploratory-curriculum/#wetext) & Advanced Writing in Your Major (https://catalog.spu.edu/undergraduate/degree-requirements/baccalaureate-degree-requirements/w-requirement/#writingcoursestext))	3
MAT 3360 or DAT 4380	Probability and Statistics [2] or Introduction to Machine Learning	5
	Credits	**8**
Spring		
DAT 4500	Data and Society	5
	Credits	**5**
Any Quarter		
Choose one of the following		**3-5**
CSC 3430	Algorithm Design and Analysis	
CSC 4250	Introduction to Artificial Intelligence	
MAT 3237	Differential Equations	
MAT 4363	Mathematical Statistics	
MAT 4725	Numerical Analysis	
MAT 4830	Mathematical Modeling	
	Credits	**3**
	Total Credits	**140-145**

1 Recommend PHI 1001 Logic and Critical Thinking for WKH and ECN 2101 Principles of Microeconomics or ECN 2102 Principles of Macroeconomics for WKSS

2 MAT 3360 and DAT 4380 are offered alternating years; take one during junior year and the other as a senior

Two-Year Plan for Transfer Students

The plan below is a suggested course sequence for transfer students entering SPU with a DTA Associates Degree. As a part of the DTA, students should complete the following prerequisite courses prior to entering SPU:

- Approved calculus courses which transfer to SPU as equivalent to MAT 1234 Calculus I, MAT 1235 Calculus II, and MAT 1236 Calculus III (15 credits)
- An approved introductory statistics course which transfers to SPU as equivalent to MAT 2360 Introduction to Statistics for the Sciences (5 credits)
- Two quarters of object oriented programming including data structures (10 credits)
- One course in python programming (5 credits)

It is still possible to transfer into SPU and complete a B.S. in Data Science if the student does not have all the recommended prerequisite courses above; however, it could take more than two years to complete the degree.

In addition to the prerequisites above, transferring in coursework in linear algebra and discrete mathematics may fulfill additional requirements for the major (MAT 2401 Linear Algebra and MAT 1720 Mathematics for Computer Science).

Completion of the DTA generally fulfills all general education requirements except TCOR 3001 Christian Scripture for Transfer Students and TCOR 3100 Christian Theology. Transfer students who have not completed a DTA may be required to complete additional general education requirements not included in the plan below, which may require more than two years to complete the degree. For additional information about transfer policies, see the Transfer Credit Overview (https://catalog.spu.edu/undergraduate/admissions/transfer-credit-overview/).

Course	Title	Credits
Junior		
Autumn		
CSC 2330	Data Structures & Programming	5
DAT 3380	Introduction to Data Science	5
MAT 3333	Statistical Modeling	5
	Credits	**15**
Winter		
CSC 2431	Data Structures and Algorithms	5
DAT 4380 or MAT 3360	Introduction to Machine Learning [1] or Probability and Statistics	5
MAT 1720	Mathematics for Computer Science	5
	Credits	**15**
Spring		
DAT 3381	Data Science II	5
MAT 2401	Linear Algebra	3
TCOR 3001	Christian Scripture for Transfer Students	5
	Credits	**13**
Senior		
Autumn		
CSC 4410	Database Systems	5
PHI 2500	Science, Technology and Society	3
TCOR 3100	Christian Theology	5
	Credits	**13**
Winter		
CSC 3011	Living in a Digital World	3
MAT 3360 or DAT 4380	Probability and Statistics [1] or Introduction to Machine Learning	5
	Credits	**8**
Spring		
DAT 4500	Data and Society	5
	Credits	**5**
Any Quarter		
Choose two of the following		**6-10**
BUS 4650	Data Analytics and Visualization	
CSC 3430	Algorithm Design and Analysis	
CSC 4250	Introduction to Artificial Intelligence	
MAT 3237	Differential Equations	
MAT 4363	Mathematical Statistics	
MAT 4725	Numerical Analysis	
MAT 4830	Mathematical Modeling	
Additional Coursework to Total 90 Credits, Including 60 Upper Division		**11-15**
	Credits	**21**
	Total Credits	**90**

1 MAT 3360 and DAT 4380 are offered alternating years; take one during junior year and the other as a senior