

# MAJOR IN DATA SCIENCE, NEUROSCIENCE CONCENTRATION

Data Science is the discovery of knowledge and insight through the analysis of data. As such, it draws on the study of algorithms and their implementation from computer science, the power of abstraction and of geometric and topological formalism from Mathematics, and the modeling and analysis of data from Statistics. It has emerged as a

separate field in response to the avalanche of data from web enabled sensors and instrumentation, mobile devices, web logs and transactions, and the availability of computing power for data storage and analysis. Modern data is challenging not only due to its large scale, but also because it is increasingly heterogeneous and unstructured. Information gleaned from this data none-the-less is revolutionizing diverse areas of human endeavor from health policy to high energy physics.

## Requirements Effective Fall 2023

### Freshman

		AUCC	Credits
CO 150	College Composition (GT-CO2)	1A	3
CS 150B	Culture and Coding: Python (GT-AH3)	3B	3
CS 164	CS1--Computational Thinking with Java		4
DSCI 100	First Year Seminar in Data Science		1
DSCI 369	Linear Algebra for Data Science		4
LIFE 102	Attributes of Living Systems (GT-SC1)	3A	4
MATH 156 <sup>1</sup>	Mathematics for Computational Science I (GT-MA1)	1B	4
PSY 100	General Psychology (GT-SS3)	3C	3
STAT 158	Introduction to R Programming		1
STAT 315	Intro to Theory and Practice of Statistics		3
<b>Total Credits</b>			<b>30</b>

### Sophomore

CHEM 107	Fundamentals of Chemistry (GT-SC2)	3A	4
CHEM 108	Fundamentals of Chemistry Laboratory (GT-SC1)	3A	1
CS 165	CS2--Data Structures		4
CS 220	Discrete Structures and the Applications		4
DSCI 235	Data Wrangling		2
MATH 151	Mathematical Algorithms in Matlab I		1
MATH 256 <sup>1</sup>	Mathematics for Computational Science II		4
STAT 341	Statistical Data Analysis I		3
STAT 342	Statistical Data Analysis II		3
Select one course from the following:			3-4
BZ 350	Molecular and General Genetics		
LIFE 201B	Introductory Genetics: Molecular/Immunological/Developmental (GT-SC2)	3A	
<b>Total Credits</b>			<b>29-30</b>

### Junior

BMS 300	Principles of Human Physiology		4
CS 201/PHIL 201	Ethical Computing Systems (GT-AH3)	3B	3
DSCI 320/MATH 320	Optimization Methods in Data Science		3
DSCI 335	Inferential Reasoning in Data Analysis		3
DSCI 336	Data Graphics and Visualization		1
PSY 252	Mind, Brain, and Behavior		3
Select one course from the following:			3
CO 300	Writing Arguments (GT-CO3)	2	
CO 301B	Writing in the Disciplines: Sciences (GT-CO3)	2	
CO 302	Writing in Digital Environments (GT-CO3)	2	
JTC 300	Strategic Writing and Communication (GT-CO3)	2	

Data Science Electives (Select a minimum of 4 credits from a minimum of two courses from the Data Science Electives list below)			4
1C ( <a href="https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#aucc">https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#aucc</a> )		1C	3
Historical Perspectives ( <a href="https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives">https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives</a> )		3D	3
<b>Total Credits</b>			<b>30</b>
<b>Senior</b>			
BMS 325	Cellular Neurobiology		3
BMS 345	Functional Neuroanatomy		4
DSCI 445	Statistical Machine Learning	4B	3
DSCI 478	Capstone Group Project in Data Science	4A,4C	4
PSY 458	Cognitive Neuroscience		3
Neuroscience Electives (Select two courses not previously taken from the Neuroscience Electives List below)			6
Electives			7-8
<b>Total Credits</b>			<b>30-31</b>
<b>Program Total Credits:</b>			<b>120</b>

## Data Science Electives List

Code	Title	Credits
CS 214	Software Development	3
CS 250	Computer Systems Foundations	4
CS 270	Computer Organization	4
CS 314	Software Engineering	3
CS 320	Algorithms--Theory and Practice	3
CS 370	Operating Systems	3
CS 435	Introduction to Big Data	4
CS 440	Introduction to Artificial Intelligence	4
CT 301	C++ Fundamentals	2
DSCI 473	Introduction to Geometric Data Analysis	2
DSCI 475	Topological Data Analysis	2
ECON 202	Principles of Microeconomics (GT-SS1)	3
ECON 204	Principles of Macroeconomics (GT-SS1)	3
ECON 435	Intermediate Econometrics	3
MATH 301	Introduction to Combinatorial Theory	3
MATH 317	Advanced Calculus of One Variable	3
MATH 331	Introduction to Mathematical Modeling	3
MATH 345	Differential Equations	4
MATH 360	Mathematics of Information Security	3
MATH 450	Introduction to Numerical Analysis I	3
MATH 451	Introduction to Numerical Analysis II	3
STAT 400	Statistical Computing	3
STAT 420	Probability and Mathematical Statistics I	3

## Freshman

Semester 1			
CO 150	College Composition (GT-CO2)		
CS 150B	Culture and Coding: Python (GT-AH3)		
DSCI 100	First Year Seminar in Data Science		
MATH 156	Mathematics for Computational Science I (GT-MA1)		

STAT 430	Probability and Mathematical Statistics II	3
STAT 440	Bayesian Data Analysis	3

## Neuroscience Electives List

Code	Title	Credits
BMS 405	Nerve and Muscle-Toxins, Trauma and Disease	3
BMS 425	Introduction to Systems Neurobiology	3
BMS 450	Pharmacology	3
PSY 454	Biological Psychology	3
PSY 456	Sensation and Perception	3

<sup>1</sup> The calculus requirement for the major may alternatively be satisfied by completion of MATH 160, MATH 161, and MATH 261.

## Major Completion Map

### Distinctive Requirements for Degree Program:

TO PREPARE FOR FIRST SEMESTER: The curriculum for the Major in Data Science assumes students enter college prepared to begin a year-long calculus sequence (either MATH 155/MATH 255 or MATH 160/MATH 161) in the first semester of their first year. LIFE 102 requires high school chemistry as a prerequisite; CHEM 111 requires Algebra II as a prerequisite (this prerequisite is met by having Algebra II by test credit, transfer credit, or placement out of MATH 117 and MATH 118 on Math Placement Exam).

Critical	Recommended	AUCC	Credits
X		1A	3
X		3B	3
X			1
		1B	4

PSY 100	General Psychology (GT-SS3)	X		3C	3
<b>Total Credits</b>					<b>14</b>
<b>Semester 2</b>		<b>Critical</b>	<b>Recommended</b>	<b>AUCC</b>	<b>Credits</b>
CS 164	CS1–Computational Thinking with Java	X			4
DSCI 369	Linear Algebra for Data Science				4
LIFE 102	Attributes of Living Systems (GT-SC1)	X		3A	4
STAT 158	Introduction to R Programming	X			1
STAT 315	Intro to Theory and Practice of Statistics	X			3
<b>Total Credits</b>					<b>16</b>
<b>Sophomore</b>					
<b>Semester 3</b>		<b>Critical</b>	<b>Recommended</b>	<b>AUCC</b>	<b>Credits</b>
CHEM 107	Fundamentals of Chemistry (GT-SC2)	X		3A	4
CHEM 108	Fundamentals of Chemistry Laboratory (GT-SC1)	X		3A	1
CS 165	CS2–Data Structures	X			4
MATH 256	Mathematics for Computational Science II				4
STAT 341	Statistical Data Analysis I	X			3
<b>Total Credits</b>					<b>16</b>
<b>Semester 4</b>		<b>Critical</b>	<b>Recommended</b>	<b>AUCC</b>	<b>Credits</b>
CS 220	Discrete Structures and the Applications	X			4
DSCI 235	Data Wrangling	X			2
MATH 151	Mathematical Algorithms in Matlab I	X			1
STAT 342	Statistical Data Analysis II	X			3
Select one course from the following:		X			3-4
BZ 350	Molecular and General Genetics				
LIFE 201B	Introductory Genetics: Molecular/Immunological/Developmental (GT-SC2)			3A	
<b>Total Credits</b>					<b>13-14</b>
<b>Junior</b>					
<b>Semester 5</b>		<b>Critical</b>	<b>Recommended</b>	<b>AUCC</b>	<b>Credits</b>
BMS 300	Principles of Human Physiology	X			4
DSCI 320/ MATH 320	Optimization Methods in Data Science	X			3
PSY 252	Mind, Brain, and Behavior	X			3
Select one course from the following:		X			3
CO 300	Writing Arguments (GT-CO3)			2	
CO 301B	Writing in the Disciplines: Sciences (GT-CO3)			2	
CO 302	Writing in Digital Environments (GT-CO3)			2	
JTC 300	Strategic Writing and Communication (GT-CO3)			2	
Data Science Electives (see list on Concentration Requirements tab)		X			4
<b>Total Credits</b>					<b>17</b>
<b>Semester 6</b>		<b>Critical</b>	<b>Recommended</b>	<b>AUCC</b>	<b>Credits</b>
CS 201/PHIL 201	Ethical Computing Systems (GT-AH3)			3B	3
DSCI 335	Inferential Reasoning in Data Analysis	X			3
DSCI 336	Data Graphics and Visualization	X			1
1C ( <a href="https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#aucc">https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#aucc</a> )				1C	3
Historical Perspectives ( <a href="https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives">https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives</a> )		X		3D	3
<b>Total Credits</b>					<b>13</b>
<b>Senior</b>					
<b>Semester 7</b>		<b>Critical</b>	<b>Recommended</b>	<b>AUCC</b>	<b>Credits</b>
BMS 325	Cellular Neurobiology	X			3
DSCI 445	Statistical Machine Learning	X		4B	3

Neuroscience Elective (See List on Concentration Requirements Tab)		X			3
Electives					7-8
<b>Total Credits</b>					<b>16-17</b>
<b>Semester 8</b>		<b>Critical</b>	<b>Recommended</b>	<b>AUCC</b>	<b>Credits</b>
BMS 345	Functional Neuroanatomy	X			4
DSCI 478	Capstone Group Project in Data Science	X		4A,4C	4
PSY 458	Cognitive Neuroscience	X			3
Neuroscience Elective (See List on Concentration Requirements Tab)		X			3
The benchmark courses in the 8th semester are the remaining courses in the entire program of study.					
<b>Total Credits</b>					<b>14</b>
<b>Program Total Credits:</b>					<b>120</b>