MAJOR IN DATA SCIENCE, COMPUTER SCIENCE 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
MATH 156[1]	Mathematics for Computational Science I (GT-MA1)	1B	4
STAT 158	Introduction to R Programming		1
STAT 315	Intro to Theory and Practice of Statistics		3
Biological and Physical Sciences (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#biological-physical-science)		3A	3
Diversity, Equity, and Inclusion (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#diversity-equity-inclusion)		1C	3
	Total Credits		**29**

Sophomore

CS 165	CS2--Data Structures		4
CS 220	Discrete Structures and their Applications		4
CS 250 or 270	Computer Systems Foundations Computer Organization		4
DSCI 235	Data Wrangling		2
MATH 151	Mathematical Algorithms in Matlab I		1
MATH 256[1]	Mathematics for Computational Science II		4
STAT 341	Statistical Data Analysis I		3
STAT 342	Statistical Data Analysis II		3
Biological and Physical Sciences (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#biological-physical-sciences)		3A	4
	Total Credits		**29**

Junior

CS 201/PHIL 201	Ethical Computing Systems (GT-AH3)	3B	3
CS 214	Software Development		3
Select one course from the following:			3
CS 320	Algorithms--Theory and Practice		
CS 370	Operating Systems		
DSCI 320	Optimization Methods in Data Science		3
DSCI 335	Inferential Reasoning in Data Analysis		3
DSCI 336	Data Graphics and Visualization		1
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	
Computer Science Electives (Select two CS courses from the Computer Science Electives List below)			6-8
Social and Behavioral Sciences (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#social-behavioral-sciences)		3C	3
	Total Credits		**28-30**

Senior

DSCI 445	Statistical Machine Learning	4B	3
DSCI 478	Capstone Group Project in Data Science	4A,4C	4
Data Science Electives (Select a minimum of 9 credits from the Data Science Electives List below)			9
Historical Perspectives (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives)		3D	3
Electives[2]			13-15
	Total Credits		**32-34**
	Program Total Credits:		**120**

Computer Science Electives List

Code	Title	AUCC	Credits
Select two courses from the list below not taken elsewhere in the program:			
CS 314	Software Engineering		3
CS 320	Algorithms--Theory and Practice		3
CS 370	Operating Systems		3
CS 420	Introduction to Analysis of Algorithms		4
CS 425	Introduction to Bioinformatics Algorithms		4
CS 430	Database Systems		4
CS 435	Introduction to Big Data		4
CS 440	Introduction to Artificial Intelligence		4
CS 445	Introduction to Machine Learning		4
CS 455	Introduction to Distributed Systems		4
CS 475	Parallel Programming		4

Data Science Electives List

Code	Title	AUCC	Credits
DSCI 473	Introduction to Geometric Data Analysis		2
DSCI 475	Topological Data Analysis		2
ECON 202	Principles of Microeconomics (GT-SS1)	3C	3
ECON 204	Principles of Macroeconomics (GT-SS1)	3C	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 332	Partial Differential Equations		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
MATH 460	Information and Coding Theory	3
STAT 400	Statistical Computing	3
STAT 420	Probability and Mathematical Statistics I	3
STAT 421	Introduction to Stochastic Processes	3
STAT 430	Probability and Mathematical Statistics II	3
STAT 440	Bayesian Data Analysis	3
STAT 460	Applied Multivariate Analysis	3

[1] The calculus requirement for the major may alternatively be satisfied by completion of MATH 160, MATH 161, and MATH 261.

[2] Select enough elective credits to bring the program total to a minimum of 120 credits, of which at least 42 must be upper-division (300- to 400-level).

Major Completion Map

Freshman

Semester 1		**Critical**	**Recommended**	**AUCC**	**Credits**
CO 150	College Composition (GT-CO2)			1A	3
CS 150B	Culture and Coding: Python (GT-AH3)	X		3B	3
DSCI 100	First Year Seminar in Data Science				1
MATH 156	Mathematics for Computational Science I (GT-MA1)	X		1B	4
Biological and Physical Sciences (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#biological-physical-sciences)				3A	3
	Total Credits				**14**
Semester 2		**Critical**	**Recommended**	**AUCC**	**Credits**
CS 164	CS1--Computational Thinking with Java	X			4
DSCI 369	Linear Algebra for Data Science				4
STAT 158	Introduction to R Programming	X			1
STAT 315	Intro to Theory and Practice of Statistics	X			3
Diversity, Equity, and Inclusion (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#diversity-equity-inclusion)				1C	3
	Total Credits				**15**

Sophomore

Semester 3		**Critical**	**Recommended**	**AUCC**	**Credits**
CS 165	CS2--Data Structures	X			4
CS 220	Discrete Structures and their Applications				4
STAT 341	Statistical Data Analysis I	X			3
Biological and Physical Sciences (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#biological-physical-sciences)				3A	4
	Total Credits				**15**
Semester 4		**Critical**	**Recommended**	**AUCC**	**Credits**
CS 250 or 270	Computer Systems Foundations Computer Organization				4
DSCI 235	Data Wrangling				2
MATH 151	Mathematical Algorithms in Matlab I				1
MATH 256	Mathematics for Computational Science II				4

STAT 342	Statistical Data Analysis II				3
	Total Credits				**14**
Junior					
Semester 5		**Critical**	**Recommended**	**AUCC**	**Credits**
DSCI 320	Optimization Methods in Data Science				3
Select one course from the following:		X			3
CS 320	Algorithms--Theory and Practice				
CS 370	Operating Systems				
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	
Computer Science Elective (Select course not previously taken from List on Concentration Requirements Tab)					6-8
	Total Credits				**15-17**
Semester 6		**Critical**	**Recommended**	**AUCC**	**Credits**
CS 201/PHIL 201	Ethical Computing Systems (GT-AH3)			3B	3
CS 214	Software Development				3
DSCI 335	Inferential Reasoning in Data Analysis				3
DSCI 336	Data Graphics and Visualization				1
Social and Behavioral Sciences (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#social-behavioral-sciences)				3C	3
	Total Credits				**13**
Senior					
Semester 7		**Critical**	**Recommended**	**AUCC**	**Credits**
DSCI 445	Statistical Machine Learning			4B	3
Data Science Electives (Select courses not previously taken from list on Concentration Requirements Tab)					9
Historical Perspectives (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives)				3D	3
Elective					2
	Total Credits				**17**
Semester 8		**Critical**	**Recommended**	**AUCC**	**Credits**
DSCI 478	Capstone Group Project in Data Science	X		4A,4C	4
Electives		X			11-13
The benchmark courses for the 8th semester are the remaining courses in the entire program of study.		X			
	Total Credits				**15-17**
	Program Total Credits:				**120**