MAJOR IN DATA SCIENCE, MATHEMATICS 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
1C (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#aucc)		1C	3
Biological and Physical Sciences (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#biological-physical-sciences)		3A	4
	Total Credits		**30**
Sophomore			
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[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 (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#biological-physical-sciences)		3A	3
Historical Perspectives (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives)		3D	3
Social and Behavioral Sciences (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#social-behavioral-sciences)		3C	3
	Total Credits		**30**
Junior			
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
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 at least 6 credits from the Data Science Electives List below)[2]			6-9
Math Electives (Select two courses from the Math Electives List below)			6
Electives			3
	Total Credits		**28-31**
Senior			
DSCI 445	Statistical Machine Learning	4B	3
DSCI 478	Capstone Group Project in Data Science	4A,4C	4
Data Science Electives (Select at least six credits from the Data Science Electives List below not taken in Junior year)[2]			6-9
Math Electives (Select two courses from the Math Electives List not taken in Junior year)			6
Electives[3]			10
	Total Credits		**29-32**
	Program Total Credits:		**120**

Data Science Electives List [2]

Code	Title	AUCC	Credits
Select a minimum of 15 total credits from the list below:			
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)	3C	3
ECON 204	Principles of Macroeconomics (GT-SS1)	3C	3
ECON 304	Intermediate Macroeconomics		3
ECON 306	Intermediate Microeconomics		3
ECON 435	Intermediate Econometrics		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

Math Electives List

Code	Title	Credits
Select four courses from the list below:		
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 417	Advanced Calculus I	3

MATH 430/ECE 430	Fourier and Wavelet Analysis with Apps	3
MATH 455	Mathematics in Biology and Medicine	3
MATH 460	Information and Coding Theory	3

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

[2] A minimum of 15 total credits must be selected from the Data Science Electives in the Junior and Senior years.

[3] 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)			1B	4
1C (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#aucc)			X	1C	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
Biological and Physical Sciences (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#biological-physical-sciences)				3A	4
	Total Credits				**16**

Sophomore

Semester 3		**Critical**	**Recommended**	**AUCC**	**Credits**
CS 165	CS2--Data Structures	X			4
STAT 341	Statistical Data Analysis I	X			3
Historical Perspectives (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives)				3D	3
Social and Behavioral Sciences (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#social-behavioral-sciences)				3C	3
	Total Credits				**13**
Semester 4		**Critical**	**Recommended**	**AUCC**	**Credits**
CS 220	Discrete Structures and the Applications	X			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
Biological and Physical Sciences (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#biological-physical-sciences)				3A	3
	Total Credits				**17**

Junior

Semester 5		**Critical**	**Recommended**	**AUCC**	**Credits**
DSCI 320/ MATH 320	Optimization Methods in Data Science				3
Data Science Elective (See List on Concentration Requirements Tab)					3-4
Math Elective (See List on Concentration Requirements Tab)					3
Select one course from the following:				2	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	
Elective					3
	Total Credits				**15-16**
Semester 6		**Critical**	**Recommended**	**AUCC**	**Credits**
CS 201/PHIL 201	Ethical Computing Systems (GT-AH3)			3B	3
DSCI 335	Inferential Reasoning in Data Analysis				3
DSCI 336	Data Graphics and Visualization				1
Data Science Elective (See List on Concentration Requirements Tab)					3-5
Math Elective (See List on Concentration Requirements Tab)					3
	Total Credits				**13-15**
Senior					
Semester 7		**Critical**	**Recommended**	**AUCC**	**Credits**
DSCI 445	Statistical Machine Learning			4B	3
Data Science Elective (See List on Concentration Requirements Tab)					3-4
Math Elective (See List on Concentration Requirements Tab)					3
Electives					6
	Total Credits				**15-16**
Semester 8		**Critical**	**Recommended**	**AUCC**	**Credits**
DSCI 478	Capstone Group Project in Data Science	X		4A,4C	4
Data Science Elective (See List on Concentration Requirements Tab)		X			3-5
Math Elective (See List on Concentration Requirements Tab)		X			3
Electives		X			4
The benchmark courses for the 8th semester are the remaining courses in the entire program of study.		X			
	Total Credits				**14-16**
	Program Total Credits:				**120**