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 2022

Freshman

		AUCC	Credits
CO 150	College Composition (GT-CO2)	1A	3
CS 163 or 164	CS1---No Prior Programming Experience CS1--Computational Thinking with Java		4
CS 165	CS2--Data Structures		4
DSCI 100	First Year Seminar in Data Science		1
MATH 160	Calculus for Physical Scientists I (GT-MA1)	1B	4
MATH 161	Calculus for Physical Scientists II (GT-MA1)	1B	4
STAT 158	Introduction to R Programming		1
STAT 315	Intro to Theory and Practice of Statistics		3
Arts and Humanities (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities)		3B	3
Biological and Physical Sciences (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#biological-physical-sciences)		3A	4
	Total Credits		**31**

Sophomore

CS 220	Discrete Structures and their Applications		4
DSCI 235	Data Wrangling		2
DSCI 369	Linear Algebra for Data Science		4
MATH 151	Mathematical Algorithms in Matlab I		1
MATH 261	Calculus for Physical Scientists III		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	3
Historical Perspectives (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives)		3D	3
Social and Behavioral Sciences (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#social-behavioral-sciences)		3C	3
	Total Credits		**30**

Junior

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	

Data Science Electives (Select at least 6 credits from the Data Science Electives List below)[1]			6-9
Math Electives (Select two courses from the Math Electives List below)			6
Arts and Humanities (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities)		3B	3
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)[1]			6-9
Math Electives (Select two courses from the Math Electives List not taken in Junior year)			6
Diversity, Equity, and Inclusion (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#diversity-equity-inclusion)		1C	3
Electives[2]			6
	Total Credits		**28-31**
	Program Total Credits:		**120**

Data Science Electives List [1]

Code	Title	AUCC	Credits
Select a minimum of 15 total credits from the list below:			
CS 201/PHIL 201	Ethical Computing Systems (GT-AH3)	3B	3
CS 253	Software Development with C++		4
CS 270	Computer Organization		4
CS 320	Algorithms--Theory and Practice		3
CS 345	Machine Learning Foundations and Practice		3
CS 370	Operating Systems		3
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
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 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] A minimum of 15 total credits must be selected from the Data Science Electives in the Junior and Senior years.

[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
DSCI 100	First Year Seminar in Data Science				1
MATH 160	Calculus for Physical Scientists I (GT-MA1)			1B	4
Select one course from the following:		X			4
CS 163	CS1---No Prior Programming Experience				
CS 164	CS1--Computational Thinking with Java				
Arts and Humanities (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities)				3B	3
	Total Credits				**15**
Semester 2		**Critical**	**Recommended**	**AUCC**	**Credits**
CS 165	CS2--Data Structures	X			4
MATH 161	Calculus for Physical Scientists II (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-sciences)				3A	4
	Total Credits				**16**

Sophomore

Semester 3		**Critical**	**Recommended**	**AUCC**	**Credits**
CS 220	Discrete Structures and their Applications	X			4
MATH 261	Calculus for Physical Scientists III				4
STAT 341	Statistical Data Analysis I				3
Social and Behavioral Sciences (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#social-behavioral-sciences)				3C	3
	Total Credits				**14**
Semester 4		**Critical**	**Recommended**	**AUCC**	**Credits**
DSCI 235	Data Wrangling				2
DSCI 369	Linear Algebra for Data Science	X			4
MATH 151	Mathematical Algorithms in Matlab I				1
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	3
Historical Perspectives (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives)				3D	3
	Total Credits				**16**

Junior

Semester 5		**Critical**	**Recommended**	**AUCC**	**Credits**
DSCI 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**
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
Arts and Humanities (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities)				3B	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
Diversity, Equity, and Inclusion (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#diversity-equity-inclusion)				1C	3
Elective					3
	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
Elective		X			3
The benchmark courses for the 8th semester are the remaining courses in the entire program of study.		X			
	Total Credits				**13-15**
	Program Total Credits:				**120**