

MAJOR IN DATA SCIENCE, ECONOMICS 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
ECON 202	Principles of Microeconomics (GT-SS1)	3C	3
ECON 204	Principles of Macroeconomics (GT-SS1)	3C	3
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
Total Credits			29

Sophomore

CS 165	CS2--Data Structures		4
CS 220	Discrete Structures and the Applications		4
DSCI 235	Data Wrangling		2
ECON 211	Gender in the Economy (GT-SS1)	1C	3
ECON 304	Intermediate Macroeconomics		3
ECON 306	Intermediate Microeconomics		3
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
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
ECON 335/AREC 335	Introduction to Econometrics		3
ECON 435	Intermediate Econometrics		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	
Economics Electives (See List below)			6
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
Total Credits		31
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 not previously taken from the Data Science Electives List below)		9
Biological and Physical Sciences (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#biological-physical-sciences)	3A	4
Electives ²		10
Total Credits		30
Program Total Credits:		120

Data Science Electives List

Code	Title	AUCC	Credits
CS 214	Software Development		3
CS 250	Computer Systems Foundations		4
CS 270	Computer Organization		4
CS 320	Algorithms--Theory and Practice		3
CS 370	Operating Systems		3
CT 301	C++ Fundamentals		2
DSCI 473	Introduction to Geometric Data Analysis		2
DSCI 475	Topological Data Analysis		2
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
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

Economics Electives List

Code	Title	AUCC	Credits
ECON 315	Money and Banking		3
ECON 317	Population Economics		3
ECON 320	Economics of Public Finance		3
ECON 325	Health Economics		3

ECON 327	Law and Economics	3
ECON 332/POLS 332	International Political Economy	3
ECON 340/AREC 340	Introduction-Economics of Natural Resources	3
ECON 346/AREC 346	Economics of Outdoor Recreation	3
ECON 372	History of Economic Institutions and Thought	3
ECON 376	Political Economy of Capitalism	3
ECON 379/HIST 379	Economic History of the United States	3
ECON 404	Macroeconomic Policy	3
ECON 410	Labor Economics	3
ECON 440	Economics of International Trade and Policy	3
ECON 442	Economics of International Finance and Policy	3
ECON 460	Economic Development	3
ECON 463	Regional Economics	3
ECON 474	Recent Economic Thought	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)			3B	3
DSCI 100 First Year Seminar in Data Science				1
ECON 202 Principles of Microeconomics (GT-SS1)			3C	3
MATH 156 Mathematics for Computational Science I (GT-MA1)			1B	4
Total Credits				14

Semester 2	Critical	Recommended	AUCC	Credits
CS 164 CS1--Computational Thinking with Java				4
DSCI 369 Linear Algebra for Data Science				4
ECON 204 Principles of Macroeconomics (GT-SS1)			3C	3
STAT 158 Introduction to R Programming				1
STAT 315 Intro to Theory and Practice of Statistics				3
Total Credits				15

Sophomore

Semester 3	Critical	Recommended	AUCC	Credits
CS 165 CS2--Data Structures				4
CS 220 Discrete Structures and the Applications		X		4
ECON 306 Intermediate Microeconomics				3
STAT 341 Statistical Data Analysis I				3
Total Credits				14

Semester 4	Critical	Recommended	AUCC	Credits
DSCI 235 Data Wrangling				2
ECON 211 Gender in the Economy (GT-SS1)			1C	3
ECON 304 Intermediate Macroeconomics				3
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					16
Junior					
Semester 5					
		Critical	Recommended	AUCC	Credits
DSCI 320/ MATH 320	Optimization Methods in Data Science				3
ECON 335/ AREC 335	Introduction to Econometrics				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	
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
Total Credits					15
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
ECON 435	Intermediate Econometrics				3
Economics Elective (See List on Concentration Requirements Tab)			X		6
Total Credits					16
Senior					
Semester 7					
		Critical	Recommended	AUCC	Credits
DSCI 445	Statistical Machine Learning			4B	3
Data Science Electives (See List on Concentration Requirements Tab)					9
Biological and Physical Sciences (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#biological-physical-sciences)				3A	4
Total Credits					16
Semester 8					
		Critical	Recommended	AUCC	Credits
DSCI 478	Capstone Group Project in Data Science	X		4A,4C	4
Elective		X			10
The benchmark courses in the 8th semester are the remaining courses in the entire program of study.					
Total Credits					14
Program Total Credits:					120