

DATA SCIENCE, MINOR

Data Science applies core concepts in computer science, statistics and mathematics to problems in a wide variety of fields, from physical, social, biomedical, and behavioral sciences to arts and humanities. The minor targets students with strong analytical abilities and some existing programming experience, and requires courses in statistics, data-centric programming, data management, and data analysis. It also points to courses across the University that deal with data in areas of importance to Data Science.

SEAS Second Major or Minor Option

Students interested in a second major (College students only) or minor with SEAS are required to meet with the Undergraduate Curriculum Chair from the major/minor department you wish to declare to discuss requirements and obtain approval on the Second Major or Minor form. The approved form must be returned to the SEAS Research and Academic Services Office, 109 Towne Building.

For more information: <http://www.seas.upenn.edu/undergraduate/degrees/minors.php>

Data Science Minor

Code	Title	Course Units
Core Requirements		4
CIS 1200	Programming Languages and Techniques I	
CIS 4190/5190	Applied Machine Learning ² or STAT 4710 Modern Data Mining or CIS 5200 Machine Learning	
NETS 2120	Scalable and Cloud Computing or CIS 5450 Big Data Analytics	
ENM 3210	or ESE 4020 Statistics for Data Science or STAT 4310 Statistical Inference	
Data Science Electives¹		2
Two electives required from two of the categories below. Approval required.		
<i>Data-Centric Programming</i>		
CIS 1050	Computational Data Exploration	
ENGR 1050	Introduction to Scientific Computing	
OIDD 3110	Business Computer Languages	
STAT 4050	Statistical Computing with R (Cannot be taken by SEAS students)	
STAT 4700	Data Analytics and Statistical Computing	
ESE 3050	Foundations of Data Science	
<i>Statistics</i>		
CIS 2610	Discrete Probability, Stochastic Processes, and Statistical Inference	
ESE 3010	Engineering Probability	
STAT 4300	Probability	
STAT 4760	Applied Probability Models in Marketing	
<i>Data Collection, Representation, Management and Retrieval</i>		
CIS 4550/5550	Internet and Web Systems	
CIS 4500	Database and Information Systems	

or CIS 5500	Database and Information Systems
NETS 2130	Crowdsourcing and Human Computation
OIDD 1050	Analytics in Excel VBA
STAT 4750	Sample Survey Design
<i>Data Analysis</i>	
CIS 4190	Applied Machine Learning
or CIS 5190	Applied Machine Learning
CIS 4210	Artificial Intelligence
CIS 5200	Machine Learning
MKTG 2120	Data and Analysis for Marketing Decisions
MKTG 3090	Special Topics: Experiments for Business Decision Making
OIDD 4100	Decision Support Systems
STAT 4220	Predictive Analytics for Business
STAT 4350	Forecasting Methods for Management
STAT 4710	Modern Data Mining
STAT 4740	Modern Regression for the Social, Behavioral and Biological Sciences
STAT 5200	Applied Econometrics I
<i>Modeling</i>	
NETS 3120	Theory of Networks
MKTG 2710	Models for Marketing Strategy
OIDD 3250	Computer Simulation Models
OIDD 3530	Mathematical Modeling and its Application in Finance
STAT 4330	Stochastic Processes

Total Course Units **6**

1

Approval required.

2

Both CIS 4190/5190 and CIS 5200 cannot be taken for credit toward the minor.

The degree and major requirements displayed are intended as a guide for students entering in the Fall of 2022 and later. Students should consult with their academic program regarding final certifications and requirements for graduation.