

MASTER OF DATA SCIENCE

Collaborative program with the Department of Applied Mathematics

This professional master's degree program consists of 33 credit hours of coursework including a six credit hour practicum project. The program is designed primarily for those with previous degrees or experience in computer science, statistics, mathematics, the natural or social sciences, or business, and who are interested in preparing for a career as a data science professional in business and industry. Full-time students may complete the program in one year, including one summer term.

Admission Requirements

Applicants should have a bachelor's degree from an accredited university with a minimum cumulative GPA of 3.0/4.0. A combined verbal and quantitative GRE examination score of at least 304 and an analytical writing score of at least 3.0 are required. The GRE requirement may be waived for students with a bachelor's degree from an accredited college or university in the United States with a cumulative GPA of at least 3.0/4.0.

Prerequisites include knowledge of a high level programming language at the level of CS 201 (object-oriented programming is required), a data structures and algorithms course at the level of CS 331, multivariate calculus at the level of MATH 251, linear algebra at the level of MATH 332, and probability and statistics at the level of MATH 474. Information on these courses is available in this bulletin. Proficiency and placement exams are also available.

Students with an insufficient background in computer science and/or mathematics will be required to take the relevant prerequisite courses and earn at least a "B" grade in each. These prerequisite courses do not count toward the 33 credit hour requirement.

Curriculum

Coursework includes 15 credit hours of required core courses, 12 credit hours of elective courses, and six credit hours of Data Science Capstone (see below). At least nine credit hours must be taken of 400- or 500-level CS or CSP courses and nine credit hours of 400- or 500-level MATH courses, not including the Data Science Capstone.

Up to six credit hours of 400-level undergraduate coursework may be used toward degree requirements.

The Data Science Capstone comprises three options:

- Practicum track: Students take CSP 572 Data Science Practicum, working in small teams on real-world data science problems for external clients, advised by faculty.
- Research track: Students work on a research project with a faculty advisor, taking 6 credits of CS 597 or MATH 594 over two semesters. A project proposal needs to be approved in advance by the director of the Master of Data Science program.
- Coursework track: Students take 6 credits of Application Courses or Data Science Electives.

Code	Title	Credit Hours
Data Science Core Courses		(15)
MATH 563	Mathematical Statistics	3
or MATH 564	Applied Statistics	
CS 584	Machine Learning	3
or MATH 569	Statistical Learning	
SCI 522	Public Engagement for Scientists	3
CSP 571	Data Preparation and Analysis	3
Select a minimum of one course from the following:		3
CS 525	Advanced Database Organization	3
CS 554	Data-Intensive Computing	3
CSP 554	Big Data Technologies	3

Data Science Capstone	(6)
6 credit hours of capstone, depending on track	6
Data Science Electives	(12)
12 credit hours of Data Science Electives	12
Total Credit Hours	33

Data Science Capstone

Code	Title	Credit Hours
Practicum Track		(6)
CSP 572	Data Science Practicum	6
Research Track		(6)
CS 597	Reading and Special Problems	6
or MATH 594	Professional Master's Project	
Coursework Track		(6)
6 credits of Applications Courses or Data Science Electives		6

Data Science Electives

Code	Title	Credit Hours
Computational Fundamentals		
CS 425	Database Organization	3
CS 430	Introduction to Algorithms	3
CS 450	Operating Systems	3
CS 520	Data Integration, Warehousing, and Provenance	3
CS 525	Advanced Database Organization	3
CS 528	Data Privacy and Security	3
CS 535	Design and Analysis of Algorithms	3
CS 538	Combinatorial Optimization	3
CS 546	Parallel and Distributed Processing	3
CS 553	Cloud Computing	3

CS 554	Data-Intensive Computing	3
CS 589	Software Testing and Analysis	3
CSP 554	Big Data Technologies	3
Computer Science Applications		
CS 422	Data Mining	3
CS 512	Computer Vision	3
CS 513	Geospatial Vision and Visualization	3
CS 522	Advanced Data Mining	3
CS 529	Information Retrieval	3
CS 556	Cyber-Physical Systems: Languages and Systems	3
CS 557	Cyber-Physical Systems Security and Design	3
CS 577	Deep Learning	3
CS 578	Interactive and Transparent Machine Learning	3
CS 579	Online Social Network Analysis	3
CS 581	Advanced Artificial Intelligence	3
CS 583	Probabilistic Graphical Models	3
CS 584	Machine Learning	3
CS 585	Natural Language Processing	3
Mathematics, Probability, and Statistics		
MATH 454	Graph Theory and Applications	3
MATH 481	Introduction to Stochastic Processes	3
MATH 483	Design and Analysis of Experiments	3
MATH 486	Mathematical Modeling I	3
MATH 487	Mathematical Modeling II	3
MATH 522	Mathematical Modeling	3
MATH 532	Linear Algebra	3
MATH 535	Optimization I	3
MATH 540	Probability	3
MATH 542	Stochastic Processes	3
MATH 546	Introduction to Time Series	3
MATH 563	Mathematical Statistics	3
MATH 564	Applied Statistics	3
MATH 565	Monte Carlo Methods in Finance	3
MATH 566	Multivariate Analysis	3
MATH 567	Advanced Design of Experiments	3
MATH 569	Statistical Learning	3
MATH 527	Machine Learning in Finance: From Theory to Practice	3
MATH 574	Bayesian Computational Statistics	3
MATH 584	Mathematical Methods for Algorithmic Trading	3
Mathematical and Scientific Computing		
BIOL 550	Bioinformatics	3
MATH 512	Partial Differential Equations	3
MATH 544	Stochastic Dynamics	3
MATH 577	Computational Mathematics I	3
MATH 578	Computational Mathematics II	3
MATH 590	Meshfree Methods	3

PHYS 440	Computational Physics	3
Professional Skills		
SCI 511	Project Management	3
SCI 522	Public Engagement for Scientists	3
ID 420	Fundamentals of Design	3
COM 525	User Experience Research and Evaluation	3

Applications Courses

Code	Title	Credit Hours
BIOL 440	Neurobiology	3
BIOL 550	Bioinformatics	3
BME 433	Biomedical Engineering Applications of Statistics	3
BME 504	Neurobiology	2
BME 506	Computational Neuroscience II: Vision	3
BME 507	Cognitive Neuroscience	2
BME 538	Neuroimaging	3
BME 545	Quantitative Neural Function	3
BUS 510	Strategic Management	3
BUS 550	Business Statistics	3
CAE 576	Applications of Unmanned Aerial Vehicles (UAVs or "Drones") for Construction Projects	3
CHE 560	Statistical Quality and Process Control	3
COM 501	Introduction to Linguistics	3
COM 583	Social Networks	3
COM 584	Humanizing Technology	3
ECE 563	Artificial Intelligence in Smart Grid	3
FDSN 401	Nutrition, Metabolism, and Health	3
FDSN 408	Food Product Development	3
FDSN 410	Food Plant Operations	3
FDSN 435	Performance Management in Food Operations	3
MAX 501	Digital Marketing	3
MAX 522	Predictive Analytics	3
MAX 523	Social Media Marketing Analytics	3
MAX 526	Quantitative Marketing Models	3
MMAE 440	Introduction to Robotics	3
MMAE 500	Data Driven Modeling	3
MMAE 540	Robotics	3
MSF 502	Statistical Analysis in Financial Markets	3
MSF 503	Financial Modeling	3
PHIL 551	Science and Values	3
PHIL 574	Ethics in Computer Science	3
PSYC 423	Learning Theory	3
PSYC 426	Cognitive Science	3
PSYC 503	Learning and Cognition	3
SSCI 422	Complex Organizations	3

Master of Data Science Curriculum

					Year 1
Semester 1	Credit Hours	Semester 2	Credit Hours	Semester 3	Credit Hours
CS 525, 554, or CSP 554		3 CS 584 or MATH 569		3 CSP 572	6
MATH 563 or 564		3 CSP 571		3	
SCI 522		3 Data Science Elective		3	
		9			6
					Year 2
Semester 1	Credit Hours				
SCI 511		3			
Data Science Elective		3			
Data Science Elective		3			
		9			
Total Credit Hours: 33					