The Master of Science in Applied Data Science gives students a thorough knowledge of techniques in the field of analytics and data science, and the ability to apply them to real-world business scenarios. Building from a core in applied statistics, math and programming, students are provided with advanced analytical training to develop their ability to draw insights from big data. This includes: machine learning and predictive analytics, deep learning, reinforcement learning, data engineering platforms, time series analysis, linear and non-linear models, statistical methods, and other sophisticated techniques for analyzing complex data.

The program is highly applied in nature, integrating business strategy, project-based learning, simulations, case studies, and specific electives addressing the analytical needs of various industry sectors. Through partnerships with key employers, the program also provides students with a client based, 2 term Capstone experience as well as access to career networks and employment pathways upon graduation.

• Program type: masters degree program
• Program structure, courses, requirements, and application (https://grahamschool.uchicago.edu/credit/master-science-analytics/index/)
• Location: online (synchronous and asynchronous)
• Full-time: weekday, weekday evening, and Saturday classes (as available)
• Part-time: weekday evenings and Saturday classes (as available)
• Time to completion: 1-4 years
• Only courses with a grade of B- or better will count toward degree requirements

Minimum G.P.A. for satisfactory academic progress: 3.0

Admission criteria:
• Online application
• One transcript from each prior academic institution
• Candidate statement
• Resume or CV

Applicants who attended an international university must also:
• Satisfy English language proficiency requirement
• Provide course by course evaluation

Program requirements:
12 courses curriculum
• Foundational Skills courses [non-credit courses, 4 depending on assessment results of 80% or higher to waive the course(s)]
• Core courses (7)
• Electives (3)
• Capstone project (2)

Foundational Courses:
Foundation courses provide the basis for our rigorous applied data science degree that support the theoretical, strategic, and practical analytics studies in more advanced courses. Students with sufficient preparation may be eligible to bypass the programming course.

Pre-quarter foundational courses (non-credit):
Students are required to take the following pre-quarter courses, unless they receive an 80% or higher on the course assessments.
• MSCA 31000 (Course offered during pre-quarter; waived with 80% or higher on the Statistics assessment)
• MSCA 37020 (Course offered during pre-quarter; waived with 80% or higher on the R assessment)
• MSCA 37021 (Course offered during first 5-weeks of the first admitted quarter; waived with 80% or higher on the Python assessment)
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MSCA 37016 (Course offered during second 5-weeks of the first admitted quarter; waived with 80% or higher on the Linear Algebra assessment)

**MSCA Core requirements:**
- MSCA 31006
- MSCA 31007
- MSCA 31008
- MSCA 31009
- MSCA 31010

One of the following Data Engineering courses*
- MSCA 31012
- MSCA 31013

One of the following Leadership courses*
- MSCA 31003 Leadership Skills
- MSCA 31015 Data Science for Consulting

**MSCA Electives (subject to instructor availability):**
- MSCA 32001 Financial Analytics
- MSCA 32003 Marketing Analytics
- MSCA 32007
- MSCA 32009
- MSCA 32013 Optimization and Simulation Methods for Analytics
- MSCA 32014
- MSCA 32015 Digital Marketing Analytics in Theory and Practice
- MSCA 32017
- MSCA 32018
- MSCA 32019
- MSCA 32020
- MSCA 32021
- MSCA 32023

**Capstone project:**
- MSCA 34002
- MSCA 34003

**Non-credit workshops & short courses:**
- MSCA 37001 Hadoop Workshop (Workshop content is taken apart of the MSCA 31012 or MSCA 31013 course curriculum)
- MSCA 37002 Linux Workshop (Workshop content is taken apart of the MSCA 31012 or MSCA 31013 course curriculum)
- MSCA 37019 Your Career in Data Science

*Optional core courses may be taken as electives.
**Optional core courses may be taken as electives.

**M.S. IN ANALYTICS COURSES**

**MSCA 31011. Statistical Analysis Review. 000 Units.**
Lab / TA review session to supplement MSCA 31007: Statistical Analysis

**MSCA 32001. Financial Analytics. 100 Units.**
This course concentrates on the following topics: review of financial markets and assets traded on them; main characteristics of financial analytics: returns, yields, volatility; review of stochastic models of market price and their statistical representations; concept of arbitrage, elements of arbitrage pricing approach; principles of volatility analyses, implied vs. realized volatility; correlation, cointegration and other relationships between various financial assets; market risk analytics and management of portfolios of financial assets. The course puts special emphasis on covering main steps of building analytics from visualizing data and building intuition about their structure and patterns to selecting appropriate statistical method to interpretation of the results and
building analytical models. Topics are illustrated by data analysis projects using R. Basic familiarity with R is a requirement.
Terms Offered: Summer Winter
Prerequisite(s): MSCA 31007: Statistical Analysis

MSCA 32003. Marketing Analytics, 100 Units.
(Data Science for Algorithmic Marketing) This course focuses on data science methods and algorithms for that are used to develop marketing strategies, and create a link between marketing, customer behavior and business outcome. The course will focus on analytical techniques organized according to the Strategic Marketing Process. The course would cover algorithms for competitive analysis and market sizing, market segmentation, targeted marketing via database marketing, design of new products, market sizing & forecasting via diffusion models, real time product positioning, algorithmic marketing in the digital world, pricing and promotions, marketing effectiveness and ROI. The course will use a combination of lecture, in-class discussions, and group work.
Terms Offered: Autumn Spring
Prerequisite(s): MSCA 31007: Statistical Analysis

MSCA 32013. Optimization and Simulation Methods for Analytics. 100 Units.
This course introduces students to how optimization and simulation techniques can be used to solve many real-life problems. It will cover two classes of optimization methods. First class has been developed to optimize real, non-simulated systems or to find the optimal solution of a mathematical model. The methods that belong to this class include linear programming, quadratic programming and mixed-integer programming. Second class of methods has been developed to optimize a simulation model. The difference with the classical mathematical programming methods is that the objective function (which is the function to be minimized or maximized) is not known explicitly and is defined by the simulation model (computer code). The course will demonstrate multiple approaches to build simulation models, such as discrete event simulations and agent-based simulations. Then, it will show how stochastic optimization and heuristic approaches can be used to analyze the simulated system and design a sequence of computational experiments that allow to develop a basic understanding of a particular simulation model or system through exploration of the parameter space, to find robust plausible behaviors and conditions and robust near-optimal solutions that are not prone to being unstable under small perturbations.
Terms Offered: Summer Winter
Prerequisite(s): MSCA 31007: Statistical Analysis

MSCA 32015. Digital Marketing Analytics in Theory and Practice. 100 Units.
Successfully marketing brands today requires a well-balanced blend of art and science. This course introduces students to the science of web analytics while casting a keen eye toward the artful use of numbers found in the digital space. The goal is to provide marketers with the foundation needed to apply data analytics to real-world challenges they confront daily in their professional lives. Students will learn to identify the web analytic tool right for their specific needs; understand valid and reliable ways to collect, analyze, and visualize data from the web; and utilize data in decision making for their agencies, organizations or clients. By completing this course, students will gain an understanding of the motivations behind data collection and analysis methods used by marketing professionals; learn to evaluate and choose appropriate web analytics tools and techniques; understand frameworks and approaches to measuring consumers' digital actions; earn familiarity with the unique measurement opportunities and challenges presented by New Media; gain hands-on, working knowledge of a step-by-step approach to planning, collecting, analyzing, and reporting data; utilize tools to collect data using today's most important online techniques: performing bulk downloads, tapping APIs, and scraping webpages; and understand approaches to visualizing data effectively.
Terms Offered: Summer Winter

MSCA 37001. Hadoop Workshop, 000 Units.
This short course is designed to provide a brief, practical introduction to working with data on a Hadoop cluster. The course is aimed at students with no prior knowledge of Hadoop. Topics covered include loading data into Hadoop cluster, using Hive HQL and using Pig script language. Course includes live demos and tutorials so students should complete exercises in class. Students who complete the course will acquire skills to be able to take further studies in Big Data and Text Analytics course.

MSCA 37002. Linux Workshop, 000 Units.
This short practical course is designed to provide a brief introduction to Linux operating system. It is aimed at students with no prior knowledge of Linux. Topics covered include uploading files to Linux account, working with files in Linux and managing processes in Linux shell. The course includes live demos and tutorials. Students who complete this tutorial course will acquire skills to be able to take further studies in Big Data and Text Analytics course.

MSCA 37003. Python Workshop, 000 Units.
This short course is designed to provide a brief introduction to Python programming language to students with no prior knowledge of Python. Topics covered in the course include Python data types, reading/writing data files, flow control in Python and working with Python modules. The course also introduces Spyder and Jupyter GUIs. Students who complete this introductory course should be able to write and execute simple Python scripts and take further studies in Big Data and Text Analytics course.
MSCA 37004. RCC Workshop. 000 Units.
TBD

MSCA 37005. Tableau Workshop. 000 Units.
TBD

MSCA 37011. Deep Learning & Image Recognition. 000 Units.
This course in Deep Learning and Image Recognition will provide a practical, hands-on set of lectures on Deep Learning and Image Processing tools and techniques. It will emphasize practice over advanced mathematical theory, and students will spend a considerable amount of class time gaining experience on Neural Networks and their applications in Python and other open source libraries.
Terms Offered: Autumn Spring
Prerequisite(s): MSCA 31008: Data Mining or MSCA 31009: Machine Learning

MSCA 37017. Advanced Research. 000 Units.
This course will focus on professional development needs of the data scientist as they work to advance in their career through this masters program. The core areas of research will focus in on how to discover your personal strengths and passions, explore the broad array of jobs that data scientists advance through, and also focus on the companies that may be the best fit for the next stages of each student's career. The focus developed through this research will help prepare the student for the data science marketplace, present themselves confidently, and accelerate the students professional successful career search process.
Instructor(s): Gregory Green
Terms Offered: Autumn
Prerequisite(s): Restricted to MSCA and MSAP students only.

MSCA 37019. Your Career in Data Science. 000 Units.
This course will help you navigate your career in data science and land a job that fits your needs and desires. It starts with taking a deeper discovery into who you are, clarifying what you want to do with your career, and navigating the market to find the right company and job match.
Instructor(s): Jennifer Schmidt, Gregory Green
Terms Offered: Autumn Spring Winter. Winter, Spring, Autumn 2021, Spring 2022
Prerequisite(s): Restricted to MSCA & MSAP students, and MScA Alumni Scholars only.

MSCA 40100. Analytics Practicum. 000 Units.
Analytics Practicum is part of the co-operative educational agreement between MScA program and employers that provides off-campus work authorization for international students to pursue internships. The internships must meet the requirement that students archive at least five learning objectives of the course. The learning objectives are about students developing or sharpening their skills in applying analytical tools to solve real life problems.
Terms Offered: Autumn Spring Summer Winter