MSDS Curriculum (2 years, 12 graded courses, 32 credit hours)*

- MSDS students will be automatically enrolled into all core courses.
- Core courses are scheduled Mondays through Thursdays. Classrooms are generally close to (or in) Dell 1/2.
- A minimum of B- in each class and a cumulative GPA of 3.00 are required to meet degree requirements.

The MSDS curriculum is evolved every academic year to keep up with industry standards and therefore is subject to change.

Summer 1 (Summer Session II & III), 9 credit hours in total

Starting in Summer session II (June)
DS 5100: Programming for Data Science (3)

An introduction to essential programming concepts, structures, and techniques. Students will gain confidence in not only reading code, but also learning what it means to write good quality code. Additionally, essential and complementary topics are taught, such as testing and debugging, exception handling, and an introduction to visualization. This course is project based, consisting of a semester project and final project presentations.

Starting in Summer session III (July)
STAT 6021: Linear Models for Data Science (3)

An introduction to linear statistical models in the context of data science. Topics include simple, multiple linear regression, logistic regression, and generalized linear models. The primary software is R. Data wrangling in R will also be covered.

Eight week course, Summer sessions II and III
DS 6001: Practice and Application of Data Science (3)

This course covers data science practice, including communication, exploratory data analysis, and visualization. Also covered are the selection of algorithms to suit the problem to be solved, user needs, and data. Case studies will explore the impact of data science across different domains.

Fall 1, 3 credit hours in total

CS 5012: Foundations of Computer Science (3)

Provide a foundation in discrete mathematics, data structures, algorithmic design and implementation, computational complexity, parallel computing, and data integrity and consistency for non-CS, non-CpE students. Case studies and exercises will be drawn from real-world examples (e.g., bioinformatics, public health, marketing, and security).

Spring 1, 5 credit hours in total

DS 6002: Ethics of Big Data (2)

This course examines the ethical issues arising around big data and provides frameworks, context, concepts, and theories to help students think through and deal with the issues as they encounter them in their professional lives.

Elective 1 (5000-level or higher, at least 3 credit hours)

Two 1.5 credit MBA courses transferred at the end of first year to MSDS program to fulfill 3 credit hours of elective requirements: GBUS 7351 & 7352, Decisions Analysis 1 &11

Fall 2, 7 credit hours in total

DS 6030 Statistical Learning (3)

This course covers fundamentals of data mining and machine learning within a common statistical framework. Topics include regression, classification, clustering, resampling, regularization, tree-based methods, ensembles, boosting, and Support Vector Machines. Coursework is conducted in the R programming language.

DS 6040: Bayesian Machine Learning (3)

Bayesian inferential methods provide a foundation for machine learning under conditions of uncertainty. Bayesian machine learning techniques can help us to more effectively address the limits to our understanding of world problems. This class covers the major related techniques, including Bayesian inference, conjugate prior probabilities, naive Bayes classifiers, expectation maximization, Markov chain monte carlo, and variational inference.

DS 6011: Data Science Capstone Project Work I (1)

This course is designed for capstone project teams to meet in groups, with advisors, and with clients to advance work on their projects.

Spring 2, 8 credit hours in total

DS 6050: Deep Learning (3)

A graduate-level course on deep learning fundamentals and applications with emphasis on their broad applicability to problems across a range of disciplines. Topics include regularization, optimization, convolutional networks, sequence modeling, generative learning, instance-based learning, and deep reinforcement learning. Students will complete several substantive programming assignments.

DS 6013: Data Science Capstone Project Work II (2)

This course is designed for capstone project teams to meet in groups, with advisors, and with clients to advance work on their projects.

Elective 2 (5000-level or higher, at least 3 credit hours)*

Elective 2 can only be taken in the Spring 2 term, up to a total of 3 credit hours. Additional credit hours will require further consideration.

A sampling of possible electives

- CS 6160: Theory of Computation
- CS 6444: Parallel Computing
- CS 6501: Special Topics in Computer Science (Topics approved by the SDS)
    - Examples of accepted topics are: Text Mining, Cloud Computing, Defense Against the Dark Arts, Vision & Language.
- CS 6750: Database Systems
- DS 5001: Exploratory Text Analytics
- DS 5110: Big Data Systems
- ECON 8720: Time Series Econometrics
- ECON 7720: Econometrics II
- EVSC 7070: Advanced Use of Geographical Information Systems
- GCOM 7240: Advanced Quantitative Analysis
- PHS 5705: Recent Advances in Public Health Genomics
- PHS 7310: Clinical Trials Methodology
- PSYC 5720: Fundamentals of Item Response Theory
- PSYC 7760: Introduction to Applied Multivariate Methods
- SARC 5400: Data Visualization
- STAT 6250: Longitudinal Data Analysis
- STAT 6260: Categorical Data Analysis
- SYS 6023: Cognitive Systems Engineering
- SYS 6050: Risk Analysis
- SYS 6582: Selected Topics in Systems Engineering (Topics approved by the SDS)
    - Examples of accepted topics are: Reinforcement learning, User Experience Design, Sensors & Perception
- SYS 7001: System and Decision Sciences

Other electives are possible, depending on available courses and as approved by the School of Data Science.