DATA SCIENCE

The part-time Data Science program balances theory and applications so
that you can advance your career long term.

The rigorous curriculum focuses on the fundamentals of computer
science, statistics, and applied mathematics, while incorporating
real-world examples. By learning from practicing engineers and data
scientists, graduates are prepared to succeed in specialized jobs
involving everything from the data pipeline and storage to statistical
analysis and eliciting the story the data tells.

Courses are offered online as well as in-person at the Applied
Physics Laboratory. The Master of Science degree or Post-Master’s
Certificate may be completed fully online, fully in person, or via a blend
of the two.

Program Committee

John A. Piorkowski, Program Co-Chair
Principal Professional Staff
JHU Applied Physics Laboratory

James C. Spall, Program Co-Chair
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JHU Applied Physics Laboratory
Research Professor, Department of Applied Mathematics and Statistics
JHU Whiting School of Engineering

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Senior Manager, Data Science

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Programs

• Data Science, Master of Science (https://e-catalogue.jhu.edu/
  engineering/engineering-professionals/data-science/data-science-
  master/)
• Data Science, Post-Master’s Certificate (https://e-catalogue.jhu.edu/
  engineering/engineering-professionals/data-science/data-science-
  post-masters-certificate/)

Courses

EN.685.621. Algorithms for Data Science. 3 Credits.
This follow-on course to data structures (e.g., EN.605.202 Data
Structures) providing a survey of computer algorithms, examines
fundamental techniques in algorithm design and analysis, and develops
problem-solving skills required in all programs of study involving data
science. Topics include advanced data structures for data science
(tree structures, disjoint set data structures), algorithm analysis
and computational complexity (recurrence relations, big-O notation,
introduction to complexity classes (P, NP and NP-completeness)), data
transformations (FFTs, principal component analysis), design paradigms
(divide and conquer, greedy heuristic, dynamic programming), and graph
algorithms (depth-first and breadth-first search, ordered and unordered
trees). Advanced topics are selected from among the following:
approximation algorithms, computational geometry, data preprocessing
methods, data analysis, linear programming, multi-threaded algorithms,
matrix operations, and statistical learning methods. The course will draw
on applications from Data Science. Course Prerequisite(s): EN.605.201
Introduction to Programming Using Java or equivalent. EN.605.203
Discrete Mathematics or equivalent is recommended. Course Note(s):
This required foundation course must be taken before other 605.xxx
courses in the degree. This course does not satisfy the foundation course
requirement for Bioinformatics, Computer Science, or Cybersecurity.
Students can only earn credit for one of EN.605.620, EN.605.621, or
EN.685.621.

EN.685.648. Data Science. 3 Credits.
This course will cover the core concepts and skills in the interdisciplinary
field of data science. These include problem identification and
communication, probability, statistical inference, visualization, extract/
transform/load (ETL), exploratory data analysis (EDA), linear and logistic
regression, model evaluation and various machine learning algorithms
such as random forests, k-means clustering, and association rules. The
course recognizes that although data science uses machine learning
techniques, it is not synonymous with machine learning. The course
emphasizes an understanding of both data (through the use of systems
tory, probability, and simulation) and algorithms (through the use
of synthetic and real data sets). The guiding principles throughout
are communication and reproducibility. The course is geared towards
giving students direct experience in solving the programming and
analytical challenges associated with data science. The assignments
weight conceptual (assessments) and practical (labs, problem sets)
understanding equally. Prerequisite(s): A working knowledge of Python
scripting and SQL is assumed as all assignments are completed in
Python.
EN.685.795. Capstone Project in Data Science. 3 Credits.
This course permits graduate students in data science to work with a faculty mentor to explore a topic in depth or conduct research in selected areas. Requirements for completion include submission of a significant paper or project. Prerequisite(s): Seven data science graduate courses including two courses numbered 605.7xx or 625.7xx or admission to the post-master’s certificate program. Students must also have permission of a faculty mentor, the student's academic advisor, and the program chair. Course Note(s): Students may not receive credit for both EN.685.802 Independent Study in Data Science II and EN.685.795.

EN.685.801. Independent Study in Data Science I. 3 Credits.
This course permits graduate students in data science to work with a faculty mentor to explore a topic in depth or conduct research in selected areas. Requirements for completion include submission of a significant paper suitable to be submitted for publication. Prerequisite(s): Seven data science graduate courses including two courses numbered 605.7xx or 625.7xx or admission to the post-master’s certificate program. Students must also have permission of a faculty mentor, the student's academic advisor, and the program chair.

EN.685.802. Independent Study in Data Science II. 3 Credits.
Students wishing to take a second independent study in data science should sign up for this course. Prerequisite(s): EN.605.801 Independent Study in Data Science I and permission of a faculty mentor, the student's academic advisor, and the program chair. Course Note(s): Students may not receive credit for both EN.685.795 Capstone Project in Data Science and EN.685.802.