

# DATA ANALYTICS AND ENGINEERING, MASTER OF SCIENCE

## Admission Requirements

Applicants (degree seeking and special student) must meet the general requirements for admission (<https://e-catalogue.jhu.edu/engineering/engineering-professionals/admission-requirements/>) to graduate study. The applicant's prior education must include the following courses:

1. One year of calculus (2 semesters or 3 quarters);
2. An introductory course in probability and statistics and
3. Familiarity with the programming language Python (demonstrated through credit-bearing coursework, MOOC course completion with verification, or work experience).
4. Students pursuing the **Simulation and Modeling Focus Area** are strongly recommended to have completed Calculus III (Multivariable Calculus) or equivalent.

Applicants whose prior education does not include the prerequisites listed above may still enroll under provisional status, followed by full admission status once they have completed the missing prerequisites. Missing prerequisites may be completed with Johns Hopkins Engineering (all prerequisites are available from the table below) or at another regionally accredited institution. Applicants typically have earned a grade point average of at least 3.0 on a 4.0 scale (B or above) in the latter half of their undergraduate studies. These prerequisite courses do not count toward the degree requirements. Transcripts from all college studies must be submitted. When reviewing an application, the candidate's academic and professional background will be considered.

## Provisional Courses

Code	Title	Credits
EN.625.108	Calculus I	4
& EN.625.109	and Calculus II	
or EN.605.156	Calculus for Engineers	
EN.625.240	Introduction to Probability and Statistics	3
EN.625.250	Multivariable Calculus and Complex Analysis <sup>1</sup>	3
EN.605.206	Introduction to Programming Using Python	3

<sup>1</sup> Students pursuing the **Simulation and Modeling Focus Area** are strongly recommended to have completed Calculus III (Multivariable Calculus) or equivalent.

## Program Requirements

To earn a Master of Science in Data Analytics Engineering, 10 courses (30 credits) approved by an advisor, must be completed within five years. The curriculum consists of four (12 credits) required core courses, four (12 credits) elective courses from the same focus area with at least two at the 700-level, and two (6 credits) remaining courses from the focus area lists or any relevant external course in the Computer Science, Cybersecurity, Applied and Computational Mathematics, Information Systems Engineering, Data Science, or Artificial Intelligence

program. Only **one** C-range grade (C+, C, or C-) can count toward the master's degree.

## Core Courses

Code	Title	Credits
EN.635.631	Foundations of Data Analytics	3
EN.635.782	Ethics in Intelligent Systems	3
EN.685.652	Data Engineering Principles and Practice	3
EN.685.662	Data Patterns and Representations	3

## Focus Areas

Choose at least four courses from a focus area with at least two courses at the 700-level (i.e. xxx.7xx)

### Artificial Intelligence (p. 1)

### Cybersecurity (p. 1)

### Data Engineering (p. 2)

### Machine Learning and Cloud Computing (p. 2)

### Simulation and Modeling (p. 2)

#### Artificial Intelligence

Code	Title	Credits
<b>Artificial Intelligence Focus Area Core</b>		
<b>Credits</b>		
EN.685.621	Algorithms for Data Science <sup>1</sup>	3
<b>Artificial Intelligence Focus Area Electives</b>		
<b>Credits</b>		
EN.605.645	Artificial Intelligence	3
EN.605.724	Applied Game Theory	3
EN.605.745	Reasoning Under Uncertainty	3
EN.635.603	AI/ML Ops	3
EN.635.627	Intelligent Decision Support Systems	3
EN.695.715	Assured Autonomy	3
AS.470.743	Data Mining and Predictive Analytics	3
AS.473.602	Intelligence Analysis	3

<sup>1</sup> Must be taken prior to any courses in the Artificial Intelligence Focus Area and is counted as one (1) of the required four courses.

#### Cybersecurity

Code	Title	Credits
<b>Cybersecurity Focus Area Core Course</b>		
<b>Credits</b>		
EN.695.601	Foundations of Information Assurance <sup>2</sup>	3
<b>Cybersecurity Focus Area Electives</b>		
<b>Credits</b>		
EN.625.680	Cryptography	3
EN.635.676	Cybersecurity in Information Systems	3
EN.635.775	Cyber Operations, Risk, and Compliance	3
EN.695.622	Web Security	3
EN.695.721	Network Security	3
AS.470.671	Risk Management Analytics	3
AS.470.731	Privacy in a Data-driven Society	3

<sup>2</sup> **EN.695.601 - Foundations of Information Assurance** must be taken prior to any courses in the Cybersecurity Focus Area and is counted as one (1) of the four courses.

**Data Engineering**

**EN.685.621 - Algorithms for Data Science** must be taken prior to any courses in the Data Engineering Focus Area and is counted as one (1) of the four courses.

Code	Title	Credits
<b>Data Engineering Focus Area Core Course</b>		<b>Credits</b>
EN.685.621	Algorithms for Data Science <sup>3</sup>	3
<b>Data Engineering Focus Area Electives</b>		<b>Credits</b>
EN.685.603	Foundations of Algorithm Analysis	3
EN.605.741	Large-Scale Database Systems	3
EN.605.788	Big Data Processing Using Hadoop	3
EN.635.601	Foundations of Information Systems Engineering	3
EN.635.632	Data Engineering for AI Systems	3
EN.635.671	Data Recovery & Continuing Operations	3
EN.685.701	Data Science: Modeling and Analytics	3
AS.470.703	Urban Data Analytics	3
AS.470.764	Survey Methodology	3

<sup>3</sup> **EN.685.621 - Algorithms for Data Science** must be taken prior to any courses in the Data Engineering Focus Area and is counted as one (1) of the four courses.

**Machine Learning and Cloud Computing**

Code	Title	Credits
<b>Machine Learning and Cloud Computing Focus Area Core Course</b>		<b>Credits</b>
EN.685.621	Algorithms for Data Science <sup>4</sup>	3
<b>Machine Learning and Cloud Computing Focus Area Electives</b>		<b>Credits</b>
EN.605.633	Social Media Analytics	3
EN.605.635	Cloud Computing	3
EN.605.646	Natural Language Processing	3
EN.605.744	Information Retrieval	3
EN.625.742	Theory of Machine Learning	3
EN.705.601	Applied Machine Learning	3
EN.705.742	Advanced Applied Machine Learning	3
AS.470.643	Text as Data	3

<sup>4</sup> **EN.685.621 - Algorithms for Data Science** must be taken prior to any courses in the Machine Learning and Cloud Computing Focus Area and is counted as one (1) of the four courses

**Simulation and Modeling**

**EN.625.603 - Statistical Methods and Data Analysis** must be taken prior to any courses in the Simulation and Modeling Focus Area and is counted as one (1) of the four courses.

Code	Title	Credits
<b>Simulation and Modeling Focus Area Core Course</b>		<b>Credits</b>
EN.625.603	Statistical Methods and Data Analysis <sup>5</sup>	3
<b>Simulation and Modeling Focus Area Electives</b>		<b>Credits</b>
EN.605.631	Statistical Methods for Computer Science	3
EN.605.716	Modeling and Simulation of Complex Systems	3
EN.625.661	Statistical Models and Regression	3
EN.625.664	Computational Statistics	3
EN.625.695	Time Series Analysis	3

EN.625.734	Queuing Theory	3
EN.625.740	Data Mining	3
EN.625.741	Game Theory	3
EN.685.640	Mathematical Reasoning and Structure for Data Science	3
AS.470.758	Data-Driven Campaigns and Elections	3

<sup>5</sup> **EN.625.603 - Statistical Methods and Data Analysis** must be taken prior to any courses in the Simulation and Modeling Focus Area and is counted as one (1) of the four courses.