# DATA SCIENCE AND ANALYTICS - COMPUTATIONAL DATA SCIENCE CONCENTRATION (MS)

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Bradley University offers an interdisciplinary graduate program leading to the degree of master of science in Data Science and Analytics. This course of study is designed to prepare students for professional careers in the field or for further study and research.

The Data Science and Analytics graduate program provides students with the necessary skills to effectively use large data sets to solve problems and potentially find new insights.

Students can concentrate their study in various application areas including: 1) business analytics, 2) computational data science, 3) engineering analytics and 4) logistics analytics.

Admission requirement to the Data Science and Analytics program is given below:

- completed at least one semester of calculus

The Computational Data Science concentration provides students with the necessary skills to understand the theory and algorithms utilized in data science and to be able to implement and apply them. The concentration is comprised of 15 semester hours of study.

In addition to satisfying all the Graduate Education requirements for the degree, all candidates for the master's degree must satisfy the following departmental requirements:

- At least 30 hours of graduate-level coursework.
- No "D" grades can be counted in the completion of requirements for the degree.
- Every student must take a comprehensive assessment as defined and administered by the concentration department that the student is in.
- Students may register for only three courses per semester. Any exceptions must be approved by the appropriate department chair.
- To satisfy the core (breadth) requirement, five courses or 15 credit hours must be taken:

## Core (Breadth) Requirements

| Code | Title | Hours |
|---|---|---|
| IME 511 | Probability and Statistics for Analytics | 3.0 |
| CS 541 | Python Programming for Data Science | 3.0 |
| or CS 560 | Fundamentals of Data Science | |
| CS 571 | Database Management Systems | 3.0 |
| or IME 568 | Engineering Analytics 1 | |
| MIS 573 | Data Visualization for Business Analytics | 3.0 |
| Select one of the following: | | 3.0 |
| MIS 590 | Capstone Project for Business Analytics | 3.0 |
| CS 594 | Capstone Project for Data Science | 3.0 |
| or CS 699 | Thesis in Computer Science | |
| IME 690 | Engineering Data Analytics Capstone | 3.0 |
| or IME 691 | Research | |

To satisfy depth requirements, the student must take 15 credit hours from the concentration listed below. No course used to satisfy the core requirement may be counted as one of the courses in this requirement.

## Concentration Requirements

| Code | Title | Hours |
|---|---|---|
| **Required Courses** | | |
| Select three of the following: [1] | | 9.0 |
| CS 560 | Fundamentals of Data Science | |
| CS 562 | Machine Learning | |
| CS 563 | Knowledge Discovery and Data Mining | |
| CS 572 | Distributed Databases and Big Data | |
| **Electives** | | |
| Select two electives approved by the student's graduate advisor [2] | | 6.0 |
| CIS 576 | Data Management | |
| CIS 580 | Digital Society and Computer Law | |
| CS 541 | Python Programming for Data Science | |
| CS 560 | Fundamentals of Data Science | |
| CS 561 | Artificial Intelligence | |
| CS 562 | Machine Learning | |
| CS 563 | Knowledge Discovery and Data Mining | |
| CS 571 | Database Management Systems | |
| CS 572 | Distributed Databases and Big Data | |
| ECE 565 | Engineering Applications of Machine Learning | |
| ECO 519 | Introduction to Econometrics | |
| IME 501 | Engineering Cost Analysis | |
| IME 514 | Introduction to Operations Research | |
| IME 526 | Reliability Engineering | |
| IME 568 | Engineering Analytics 1 | |
| IME 578 | Engineering Analytics 2 | |
| IME 583 | Production Planning and Control | |
| I B 502 | Global Trade Management and Analysis | |
| MTG 502 | Logistics Tools and Techniques | |
| MTG 506 | Marketing Analytics | |
| MTG 507 | Customer Analytics | |
| MTG 624 | Marketing Decision Making | |
| MTG 640 | Obtaining, Analyzing, and Applying Marketing Information | |
| MTH 510 | Numerical Methods I | |
| Q M 526 | Business Forecasting | |
| Q M 564 | Decision Support Systems | |
| **Total Hours** | | **15** |

[1] Three of the following four courses, that you have not yet taken to fulfill the common core.
**Note**: If you fulfilled the common core by taking CS 541 Python Programming for Data Science, then one of the 3 courses taken from the list above must be CS 560 Fundamentals of Data Science.

[2] For those who choose the thesis option instead of capstone, one elective (3 ch).

**On the thesis option:**

Interested and qualified students pursuing the Computational Data Science concentration have the option to write a master's thesis. Students selecting this option are encouraged to choose a thesis advisor and topic as early as possible to plan the thesis development and any needed supporting coursework.

The following policies apply to theses:

- A minimum grade point average of 3.5 in graduate courses taken at Bradley is required for students enrolling in a thesis course, i.e., CS 699 Thesis in Computer Science.
- No student may register for a thesis until 9 hours of graduate courses have been completed in the program.
- Six credit hours of a thesis course are required and, upon completion, the thesis must be defended in an oral examination. The six hours must be in consecutive semester or terms (3+3).
- No grade will be given for a thesis course until after the oral defense. The thesis oral defense substitutes the comprehensive exam that the non-thesis students have to take.
- A written outline of the thesis project and a tentative schedule must be submitted to and approved by the graduate coordinator and the chair prior to the registration for a thesis course.