

DATA SCIENCE

Degree: B.S., Mathematics

Department of Mathematics (<https://cas.umw.edu/math/>)

The concentration in Data Science teaches principles and builds skills in the science of how and why we use data. Decision-making across all levels is increasingly shifting away from subjective human judgment and expert opinion. It is being replaced by superior evidence-based approaches driven by data and analytical models. Data Science is the discipline concerned with gathering and manipulating large volumes of data, developing statistical models to gain critical insights from it, understanding the behavior of complex systems through simulation, and making non-trivial decisions optimally, often in response to quickly changing conditions. The track in Data Science is designed to provide students with the coursework to succeed in this area.

Student Learning Outcomes

1. Students will learn the central ideas and techniques of various areas of mathematics.
2. Students will analyze, construct, and present mathematical and logical arguments.
3. Students will develop problem-solving abilities.
4. Students will discover mathematical patterns and formulate conjectures by exploration and experimentation.
5. Students will represent quantitative information by means of appropriate symbols, graphs, equations, or tables.

Major Requirements

| Code | Title | Credits |
|-------------------------------------|---|----------|
| DATA 101 | Introduction to Data Science | 3 |
| DATA 219 | Foundations for Data Science | 3 |
| STAT 180 | Introduction to Statistics | 3 |
| STAT 280 | Statistical Methods | 3 |
| STAT 320 | Applied Regression Analysis | 3 |
| STAT 381 | Probability and Statistical Inference | 3 |
| CPSC 225 | Software Development Tools | 1 |
| DATA 350 | Applications of Databases | 4 |
| MATH 121 | Calculus I | 4 |
| MATH 122 | Calculus II | 4 |
| MATH 201 | Introduction to Discrete Mathematics | 3-4 |
| or CPSC 284 | Applied Discrete Mathematics | |
| MATH 300 | Linear Algebra | 4 |
| Select one of the following: | | 3 |
| DATA 401 | Applied Machine Learning | |
| or DATA 419 | Data Mining | |
| Select one of the following: | | 3 |
| DATA 370A9 | Information Storage and Retrieval Systems | |
| or DATA 420 | Modeling and Simulation | |
| Select one of the following: | | 3 |
| DATA 402 | Analytics Applications and Development | |
| DATA 470D3 | Natural Language Processing | |

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| DATA 470 | Advanced Special Topics in Data Science (Course must be at least 3 credits.) |
| DATA 470D1 | Deep Learning in Python |
| DATA 491 | Indiv Study in Data Science (Course must be at least 3 credits.) |
| STAT 382 | Probability and Statistical Inference |
| STAT 420 | Applied Multivariate Statistics |
| STAT 461 | Topics in Statistics |

Total Credits **47-48**

General Education Requirements

The general education requirements for Bachelor of Arts/Bachelor of Science degrees (<https://catalog.umw.edu/undergraduate/general-education/requirements-bachelor-arts-bachelor-science-degrees/>) apply to all students who are seeking to earn an undergraduate B.A., B.S. or B.S.Ed. degree.

Students seeking a Bachelor of Liberal Studies degree have a separate set of BLS general education requirements (<https://catalog.umw.edu/undergraduate/general-education/requirements-bachelor-liberal-studies-degrees/>).

Electives

Elective courses are those that are not needed to fulfill a general education requirement or major program requirement but are chosen by the student to complete the 120 credits required for graduation with a B.A./B.S./B.S.Ed. degree or the BLS degree. These courses may be taken graded or pass/fail (or S/U in the case of physical education and 100-level dance). No student in a regular B.A./B.S./B.S.Ed. program may count more than 60 credits in a single discipline toward the 120 credits required for graduation.

Total Credits Required for the Degree: 120 credits

Plan of Study

This suggested plan of study should serve as a guide to assist students when planning their course selections. It is not a substitute for a student's Degree Evaluation or the Program Requirements listed for this major in the catalog. Academic planning is the student's responsibility, and course selections should be finalized only after speaking with an advisor. Students should familiarize themselves with the catalog in effect at the time they matriculated at the University of Mary Washington. Students should also familiarize themselves with general education requirements (<https://catalog.umw.edu/undergraduate/general-education/>) which can be fulfilled through general electives as well as major/minor course requirements. Course requirements and sequencing may vary with AP, IB, CLEP, Cambridge or previous coursework, transfer courses, or other conditions. To be considered full-time, an undergraduate student must be enrolled in 12 or more credits for the semester.

| Course | Title | Credits |
|---------------------------|------------------------------|-----------|
| Freshman | | |
| Fall | | |
| DATA 101 | Introduction to Data Science | 3 |
| FSEM 100 | First-Year Seminar | 3 |
| MATH 121 | Calculus I | 4 |
| General Education Courses | | 6 |
| Credits | | 16 |
| Spring | | |
| MATH 122 | Calculus II | 4 |

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| MATH 201 or CPSC 284 | Introduction to Discrete Mathematics or Applied Discrete Mathematics | 3 |
| STAT 180 | Introduction to Statistics | 3 |
| General Education Courses | | 6 |
| Credits | | 16 |
| Sophomore | | |
| Fall | | |
| DATA 219 | Foundations for Data Science | 3 |
| STAT 280 | Statistical Methods | 3 |
| General Education Courses | | 9 |
| Credits | | 15 |
| Spring | | |
| CPSC 220 | Computer Programming and Problem Solving | 4 |
| MATH 300 | Linear Algebra | 4 |
| General Education Courses | | 6 |
| Credits | | 14 |
| Junior | | |
| Fall | | |
| CPSC 225 | Software Development Tools | 1 |
| DATA 350 | Applications of Databases | 4 |
| STAT 381 | Probability and Statistical Inference | 3 |
| General Education Courses or Electives | | 9 |
| Credits | | 17 |
| Spring | | |
| STAT 320 | Applied Regression Analysis | 3 |
| DATA or STAT 300 or 400-Level Elective | | 3 |
| General Electives | | 9 |
| Credits | | 15 |
| Senior | | |
| Fall | | |
| DATA 370 or DATA 420 | Special Topics in Data Science or Modeling and Simulation | 3 |
| DATA 401 or DATA 419 | Applied Machine Learning or Data Mining | 3 |
| General Electives | | 6 |
| Credits | | 12 |
| Spring | | |
| MATH 305 | Mathematics as a Profession | 1 |
| General Electives | | 14 |
| Credits | | 15 |
| Total Credits | | 120 |

Data Science Program

Julius N. Esunge, Chair, Mathematics Department

Affiliated Faculty

Christopher J. Garcia, Business

Stephen Davies, Computer Science

Debra L. Hydorn, Mathematics

Prashant Chandrasekar, Computer Science

Melody B. Denhere, Mathematics

Jessica Zeitz Self, Computer Science