# B.S. in Data Science

Data science is the study and practice of extracting information and structure from data that can then be used for reasoning and adding value to the solution of a problem. It has growing applications in health and medicine, finance, marketing, economics, genomics, social networks, cyber-security, journalism, and other fields where data is collected. It spans academic fields in computer science and mathematics such as machine learning and statistical inference, probability, linear algebra, computer programming, software engineering, high performance computing, and cloud computing. The B.S. in Data Science program has two options, Computing (in the Ying Wu College of Computing) and Statistics (in the Department of Mathematical Sciences in the College of Science and Liberal Arts).

## B.S. in Data Science (Computing Option)

(120 credits)

**First Year**

| 1st Semester | | Credits |
| --- | --- | --- |
| CS 100 | Roadmap to Computing | 3 |
| MATH 111 | Calculus I | 4 |
| PHYS 111 | Physics I [1] | 3 |
| PHYS 111A | Physics I Lab [1] | 1 |
| ENGL 101 | English Composition: Introduction to Academic Writing | 3 |
| FYS SEM | First-Year Student Seminar | 0 |
| | **Term Credits** | **14** |

| 2nd Semester | | |
| --- | --- | --- |
| CS 113 | Introduction to Computer Science | 3 |
| MATH 112 | Calculus II | 4 |
| PHYS 121 | Physics II [1] | 3 |
| PHYS 121A | Physics II Lab [1] | 1 |
| ENGL 102 | English Composition: Introduction to Writing for Research | 3 |
| | **Term Credits** | **14** |

**Second Year**

| 1st Semester | | |
| --- | --- | --- |
| CS 114 | Introduction to Computer Science II | 3 |
| MATH 244 | Introduction to Probability Theory | 3 |
| MATH 337 | Linear Algebra | 3 |
| History and Humanities GER 200 level (http://catalog.njit.edu/undergraduate/academic-policies-procedures/general-education-requirements/ger-200-level/) | | 3 |
| Social Sciences GER (http://catalog.njit.edu/undergraduate/academic-policies-procedures/general-education-requirements/social-science-ger/) | | 3 |
| | **Term Credits** | **15** |

| 2nd Semester | | |
| --- | --- | --- |
| CS 241 | Foundations of Computer Science I | 3 |
| CS 280 | Programming Language Concepts | 3 |
| IS 350 | Computers, Society and Ethics | 3 |
| MATH 341 | Statistical Methods II | 3 |
| YWCC 207 | Computing & Effective Com | 1 |
| Data Science Elective 1 | | 3 |
| | **Term Credits** | **16** |

**Third Year**

| 1st Semester | | |
| --- | --- | --- |
| CS 288 | Intensive Programming in Linux | 3 |
| CS 301 | Introduction to Data Science | 3 |
| CS 331 | Database System Design & Mgmt | 3 |
| CS 370 | Introduction to Artificial Intelligence | 3 |

| | | |
|---|---|---|
| COM 312 | Oral Presentations | 3 |
| or COM 313 | or Technical Writing | |
| | **Term Credits** | **15** |
| **2nd Semester** | | |
| CS 435 | Advanced Data Structures and Algorithm Design | 3 |
| Data Science Elective 2 | | 3 |
| CS 482 | Data Mining | 3 |
| CS 375 | Introduction to Machine Learning | 3 |
| History and Humanities GER 300+ level (http://catalog.njit.edu/undergraduate/academic-policies-procedures/general-education-requirements/ger-300-level/) | | 3 |
| YWCC 307 | Professional Dev in Computing | 1 |
| | **Term Credits** | **16** |
| **Fourth Year** | | |
| **1st Semester** | | |
| CS 450 | Data Visualization | 3 |
| CS 444 | Big Data Systems | 3 |
| CS 492 | Data Science Capstone I | 3 |
| MATH 478 | Stat Methods in Data Sci | 3 |
| Data Science Elective 3 | | 3 |
| | **Term Credits** | **15** |
| **2nd Semester** | | |
| Humanities and Social Science Senior Seminar GER (http://catalog.njit.edu/undergraduate/academic-policies-procedures/general-education-requirements/hss-capstone/) | | 3 |
| Free Elective 1 [2] | | 3 |
| CS 493 | Data Science Capstone II | 3 |
| MATH 344 | Regression Analysis | 3 |
| Data Science Elective 4 | | 3 |
| | **Term Credits** | **15** |
| | **Total Credits** | **120** |

| Code | Title | Credits |
|---|---|---|
| Data Science (Computing Option) Electives | | |
| YWCC 310 | Co-op Work Experience I | 3 |
| CS 332 | Principles of Operating Systems | 3 |
| CS 350 | Intro to Computer Systems | 3 |
| CS 351 | Introduction to Cybersecurity | 3 |
| CS 356 | Introduction to Computer Networks | 3 |
| CS 357 | Fundamentals of Network Security | 3 |
| CS 370 | Introduction to Artificial Intelligence | 3 |
| CS 375 | Introduction to Machine Learning | 3 |
| CS 444 | Big Data Systems | 3 |
| CS 408 | Cryptography and Internet Security | 3 |
| CS 485 | Selected Topics In CS | 3 |
| MGMT 316 | Business Research Methods | 3 |
| MGMT 416 | Artificial Intelligence for Business Decisions | 3 |
| MRKT 378 | Marketing Analytics | 3 |
| MRKT 430 | Marketing Research | 3 |
| MATH 345 | Multivariate Distributions | 3 |
| MATH 388 | Introduction to Chaos Theory | 3 |
| MATH 391 | Numerical Linear Algebra | 3 |
| MATH 430 | Analytical and Computational Neuroscience | 3 |
| MATH 447 | Applied Time Series Analysis | 3 |
| MATH 448 | Stochastic Simulation | 3 |

| MATH 461 | Introduction to Statistical Computing with SAS and R | 3 |
|---|---|---|
| IS 333 | Social Network Analysis | 3 |
| IS 392 | Web Mining and Information Retrieval | 3 |
| FIN 218 | Financial Markets and Institutions | 3 |
| FIN 306 | Blockchain Technology for Business | 3 |
| FIN 310 | Data-Driven Financial Modeling | 3 |
| FIN 320 | Fin Data Analytics | 3 |
| IT 430 | Ethical Hacking for System Administrators | 3 |
| IT 485 | Special Topics in Information Technology I | 3 |

## B.S. in Data Science (Statistics Option)

(120 credits)

**First Year**

| **1st Semester** | | **Credits** |
|---|---|---|
| CS 100 | Roadmap to Computing | 3 |
| MATH 111 | Calculus I | 4 |
| PHYS 111 | Physics I [1] | 3 |
| PHYS 111A | Physics I Lab [1] | 1 |
| ENGL 101 | English Composition: Introduction to Academic Writing | 3 |
| FYS SEM | First-Year Student Seminar | 0 |
| | **Term Credits** | **14** |

| **2nd Semester** | | |
|---|---|---|
| CS 113 | Introduction to Computer Science | 3 |
| MATH 112 | Calculus II | 4 |
| PHYS 121 | Physics II [1] | 3 |
| PHYS 121A | Physics II Lab [1] | 1 |
| ENGL 102 | English Composition: Introduction to Writing for Research | 3 |
| | **Term Credits** | **14** |

**Second Year**

| **1st Semester** | | |
|---|---|---|
| CS 114 | Introduction to Computer Science II | 3 |
| MATH 244 | Introduction to Probability Theory | 3 |
| MATH 337 | Linear Algebra | 3 |
| History and Humanities GER 200 level (http://catalog.njit.edu/undergraduate/academic-policies-procedures/general-education-requirements/ger-200-level/) | | 3 |
| Social Sciences GER (http://catalog.njit.edu/undergraduate/academic-policies-procedures/general-education-requirements/social-science-ger/) | | 3 |
| | **Term Credits** | **15** |

| **2nd Semester** | | |
|---|---|---|
| CS 241 | Foundations of Computer Science I | 3 |
| CS 280 | Programming Language Concepts | 3 |
| MATH 213 | Calculus III B | 4 |
| MATH 341 | Statistical Methods II | 3 |
| History and Humanities GER 300+ level (http://catalog.njit.edu/undergraduate/academic-policies-procedures/general-education-requirements/ger-300-level/) | | 3 |
| | **Term Credits** | **16** |

**Third Year**

| **1st Semester** | | |
|---|---|---|
| MATH 340 | Applied Numerical Methods | 3 |
| MATH 344 | Regression Analysis | 3 |
| MATH 391 | Numerical Linear Algebra | 3 |
| CS 288 | Intensive Programming in Linux | 3 |

| CS 301 | Introduction to Data Science | 3 |
| --- | --- | --- |
| | **Term Credits** | **15** |
| **2nd Semester** | | |
| MATH 345 | Multivariate Distributions | 3 |
| MATH 447 | Applied Time Series Analysis | 3 |
| MATH 478 | Stat Methods in Data Sci | 3 |
| Data Science Elective 1 | | 3 |
| History and Humanities GER 300+ level (http://catalog.njit.edu/undergraduate/academic-policies-procedures/general-education-requirements/ger-300-level/) | | 3 |
| | **Term Credits** | **15** |
| **Fourth Year** | | |
| **1st Semester** | | |
| MATH 448 | Stochastic Simulation | 3 |
| MATH 461 | Introduction to Statistical Computing with SAS and R | 3 |
| MATH 462 | Statistics and Statistical Learning (Capstone I) | 3 |
| CS 450 | Data Visualization | 3 |
| Data Science Elective 2 | | 3 |
| | **Term Credits** | **15** |
| **2nd Semester** | | |
| MATH 463 | Statistics and Statistical Learning (Capstone II) | 3 |
| Math Upper Level Elective (300+ level) | | 3 |
| Data Science Elective 3 | | 3 |
| Humanities and Social Science Senior Seminar GER (http://catalog.njit.edu/undergraduate/academic-policies-procedures/general-education-requirements/hss-capstone/) | | 3 |
| Free Elective [2] | | 4 |
| | **Term Credits** | **16** |
| | **Total Credits** | **120** |

| Code | Title | Credits |
| --- | --- | --- |
| Data Science (Statistics Option) Electives | | |
| YWCC 310 | Co-op Work Experience I | 3 |
| CS 331 | Database System Design & Mgmt | 3 |
| CS 332 | Principles of Operating Systems | 3 |
| CS 350 | Intro to Computer Systems | 3 |
| CS 351 | Introduction to Cybersecurity | 3 |
| CS 356 | Introduction to Computer Networks | 3 |
| CS 357 | Fundamentals of Network Security | 3 |
| CS 370 | Introduction to Artificial Intelligence | 3 |
| CS 375 | Introduction to Machine Learning | 3 |
| CS 444 | Big Data Systems | 3 |
| CS 408 | Cryptography and Internet Security | 3 |
| CS 435 | Advanced Data Structures and Algorithm Design | 3 |
| CS 482 | Data Mining | 3 |
| MGMT 316 | Business Research Methods | 3 |
| MGMT 416 | Artificial Intelligence for Business Decisions | 3 |
| MRKT 378 | Marketing Analytics | 3 |
| MRKT 430 | Marketing Research | 3 |
| MATH 222 | Differential Equations | 4 |
| MATH 388 | Introduction to Chaos Theory | 3 |
| MATH 430 | Analytical and Computational Neuroscience | 3 |
| MATH 453 | High-Performance Numerical Computing | 3 |
| MATH 477 | Stochastic Processes | 3 |
| IS 333 | Social Network Analysis | 3 |

| IS 392 | Web Mining and Information Retrieval | 3 |
|--------|-------------------------------------|---|
| FIN 218 | Financial Markets and Institutions | 3 |
| FIN 306 | Blockchain Technology for Business | 3 |
| FIN 310 | Data-Driven Financial Modeling | 3 |
| FIN 320 | Fin Data Analytics | 3 |
| IT 430 | Ethical Hacking for System Administrators | 3 |
| IT 485 | Special Topics in Information Technology I | 3 |

1   Students considering switching to Computer Science or Mathematical Sciences should take PHYS 111/111A and 121/121A. Do not take PHYS 102/102A

2   Free electives should be chosen in consultation with the advisor. Some restrictions apply.