

MASTER OF DATA SCIENCE (MDS) DEGREE

Program Learning Outcomes for the MDS Degree

Upon completing the MDS degree, students will be able to:

1. Develop a graduate-level understanding of the computational and statistical foundations of Data Science.
2. Through in-depth study, obtain mastery of either one of the core methods of Data Science or one application area of Data Science.
3. Apply Data Science techniques to solve difficult, real world problems, beginning with raw and dirty data, and ending with actionable insights that are effectively communicated to a lay client.

Requirements for the MDS Degree

The MDS degree is a non-thesis master's degree. For general university requirements, please see [Non-Thesis Master's Degrees \(https://ga.rice.edu/graduate-students/academic-policies-procedures/regulations-procedures-non-thesis-masters-degrees/\)](https://ga.rice.edu/graduate-students/academic-policies-procedures/regulations-procedures-non-thesis-masters-degrees/). For additional requirements, regulations, and procedures for all graduate programs, please see [All Graduate Students \(https://ga.rice.edu/graduate-students/academic-policies-procedures/regulations-procedures-all-degrees/\)](https://ga.rice.edu/graduate-students/academic-policies-procedures/regulations-procedures-all-degrees/). Students pursuing the MDS degree must complete:

- A minimum of 10-13 courses (31-35 credit hours), depending on course selection, to satisfy degree requirements.
- A minimum of 31 credit hours of graduate-level study (graduate semester credit hours, coursework at the 500-level or above).
- A minimum of 24 graduate semester credit hours credit hours must be taken at Rice University.
- A minimum of 24 graduate semester credit hours must be taken in standard or traditional courses (with a course type of lecture, seminar, laboratory, lecture/laboratory).
- A minimum residency enrollment of one fall or spring semester of part-time graduate study at Rice University.
- A maximum of 2 courses (6 graduate semester credit hours) from transfer credit. For additional departmental guidelines regarding transfer credit, see the [Policies](#) (p. 3) tab.
- The requirements for one area of specialization (see below for areas of specialization). The MDS degree program offers three areas of specialization:
 - [Business Analytics](#) (p. 2), *or*
 - [Image Processing](#) (p. 2), *or*
 - [Machine Learning](#) (p. 2).
- A [Professional Development](#) (p. 2) requirement.
- A minimum overall GPA of 2.67 or higher in all Rice coursework.
- A minimum program GPA of 2.67 or higher in all Rice coursework that satisfies requirements for the non-thesis master's degree.

The courses listed below satisfy the requirements for this degree program. In certain instances, courses not on this official list may be substituted upon approval of the program's academic advisor, or where applicable, the department or program's Director of Graduate Studies. Course substitutions must be formally applied and entered into Degree Works by the department or program's [Official Certifier \(https://](#)

registrar.rice.edu/facstaff/degreeworks/officialcertifier/). Additionally, these must be approved by the Office of Graduate and Postdoctoral Studies. Students and their academic advisors should identify and clearly document the courses to be taken.

Summary

| Code | Title | Credit Hours |
|--|-------|--------------|
| Total Credit Hours Required for the MDS Degree | | 31-35 |

Degree Requirements

| Code | Title | Credit Hours |
|---|---|--------------|
| Core Requirements ¹ | | |
| Big Data | | |
| <i>Select 1 course from the following:</i> | | 3 |
| COMP 543 | GRADUATE TOOLS AND MODELS - DATA SCIENCE | |
| COMP 553 | BIG DATA MANAGEMENT FOR DATA SCIENCE | |
| COMP 643 | BIG DATA | |
| Data Visualization | | |
| COMP 665 | DATA VISUALIZATION | 3 |
| Machine Learning | | |
| <i>Select 1 course from the following:</i> | | 3 |
| COMP 642 | MACHINE LEARNING | |
| ELEC 578 | INTRODUCTION TO MACHINE LEARNING | |
| Programming | | |
| COMP 614 | COMPUTER PROGRAMMING FOR DATA SCIENCE | 3 |
| Statistics | | |
| COMP 680 | STATISTICS FOR COMPUTING AND DATA SCIENCE | 3 |
| Elective Requirements ¹ | | |
| <i>Select 1 course from the following:</i> | | 3-4 |
| COMP 510 | COMPUTER ETHICS | |
| COMP 566 | AI ETHICS | |
| COMP 580 | PROBABILISTIC ALGORITHMS AND DATA STRUCTURE | |
| COMP 582 / ELEC 512 | GRADUATE DESIGN AND ANALYSIS OF ALGORITHMS | |
| COMP 621 | SYSTEMS SOFTWARE | |
| COMP 622 | DATA ETHICS | |
| COMP 628 | CYBERSECURITY | |
| COMP 644 | DATA PRIVACY & SECURITY | |
| COMP 682 | PRINCIPLES OF ALGORITHMS AND SOFTWARE AREA | |
| Area of Specialization ¹ | | |
| <i>Select 1 from the following Areas of Specialization (see Areas of Specialization below):</i> | | 9 |
| Business Analytics | | |
| Image Processing | | |
| Machine Learning | | |
| Professional Development | | |
| <i>Select 1 from the following:</i> | | 0-3 |

A Professional Development course (see course list below)

A relevant internship 10 weeks to 6 months in length. Students are responsible for obtaining and selecting an internship that best aligns with their career goals.

Current or past post-baccalaureate relevant work experience of at least 10 weeks.

| Capstone ¹ | | |
|---------------------------|---|--------------|
| DSCI 535 / COMP 549 | APPLIED MACHINE LEARNING AND DATA SCIENCE PROJECTS | 4 |
| Total Credit Hours | | 31-35 |

Footnotes and Additional Information

¹ Students admitted into either program (online or on-campus) will be allowed to take up to 9 credit hours in the other modality (on-campus or online) with permission from the program advisors.

Areas of Specialization

Students must complete a minimum of 3 courses (minimum of 9 credit hours) from one Area of Specialization.

Area of Specialization: Business Analytics

| Code | Title | Credit Hours |
|--|---|--------------|
| <i>Select a minimum of 3 courses (minimum of 9 credit hours) from the following:</i> | | |
| BUSI 711 & BUSI 712 | DATA-DRIVEN MARKETING I and DATA-DRIVEN MARKETING II ¹ | 9 |
| BUSI 721 & BUSI 722 | DATA-DRIVEN FINANCE I and DATA-DRIVEN FINANCE II ² | |
| BUSI 731 & BUSI 732 | FOUNDATIONS OF OPERATIONS MANAGEMENT and QUANTITATIVE OPERATIONS ³ | 9 |
| INDE 545 | PRESCRIPTIVE ANALYTICS | |
| INDE 546 | COMPUTATIONAL PRESCRIPTIVE ANALYTICS | 9 |
| INDE 567 | OPTIMIZATION METHODS IN FINANCE | |
| STAT 649 | QUANTITATIVE FINANCIAL RISK MANAGEMENT | 9 |
| STAT 682 | QUANTITATIVE FINANCIAL ANALYTICS | |
| Total Credit Hours | | 9 |

Footnotes and Additional Information

¹ The course BUSI 711 can only be counted towards the Area of Specialization: Business Analytics if the course BUSI 712 is also counted towards the Area of Specialization: Business Analytics.

² The course BUSI 721 can only be counted towards the Area of Specialization: Business Analytics if the course BUSI 722 is also counted towards the Area of Specialization: Business Analytics.

³ The course BUSI 731 can only be counted towards the Area of Specialization: Business Analytics if the course BUSI 732 is also counted towards the Area of Specialization: Business Analytics.

Area of Specialization: Image Processing

| Code | Title | Credit Hours |
|--|-------|--------------|
| <i>Select a minimum of 3 courses (minimum of 9 credit hours) from the following:</i> | | |
| Total Credit Hours | | 9 |

| | |
|------------------------|---------------------------------------|
| COMP 646 | DEEP LEARNING FOR VISION AND LANGUAGE |
| ELEC 542 | GENERATIVE AI FOR IMAGE SYNTHESIS |
| ELEC 546 / COMP 546 | INTRODUCTION TO COMPUTER VISION |
| ELEC 549 | COMPUTATIONAL PHOTOGRAPHY |

Total Credit Hours 9

Area of Specialization: Machine Learning

| Code | Title | Credit Hours |
|--|---|--------------|
| <i>Select a minimum of 3 courses (minimum of 9 credit hours) from the following:</i> | | |
| COMP 514 | OPTIMIZATION: ALGORITHMS, COMPLEXITY, AND APPROXIMATIONS | 9 |
| COMP 552 | REINFORCEMENT LEARNING | |
| COMP 559 | MACHINE LEARNING WITH GRAPHS | 9 |
| COMP 631 | INTRODUCTION TO INFORMATION RETRIEVAL | |
| COMP 641 | GRADUATE SEMINAR ON INTERACTIVE MACHINE LEARNING | 9 |
| COMP 646 | DEEP LEARNING FOR VISION AND LANGUAGE | |
| COMP 647 | DEEP LEARNING | 9 |
| COMP 652 | NATURAL LANGUAGE PROCESSING | |
| COMP 653 | STATISTICAL MACHINE LEARNING | 9 |
| ELEC 515 | MACHINE LEARNING FOR RESOURCE-CONSTRAINED PLATFORMS | |
| ELEC 542 | GENERATIVE AI FOR IMAGE SYNTHESIS | 9 |
| ELEC 570 | DISTRIBUTED METHODS FOR OPTIMIZATION AND MACHINE LEARNING | |
| ELEC 573 | NETWORK SCIENCE AND ANALYTICS | 9 |
| ELEC 575 | LEARNING FROM SENSOR DATA | |
| ELEC 576 / COMP 576 | A PRACTICAL INTRODUCTION TO DEEP MACHINE LEARNING | 9 |
| ELEC 631 | ADVANCED MACHINE LEARNING | |
| Total Credit Hours | | 9 |

Professional Development

In order to fulfill the Professional Development requirement, students must select up to 1 course (up to 3 credit hours) from the following, **or**

- Complete a relevant internship 10-weeks to 6 months in length. Students are responsible for obtaining and selecting an internship that best aligns with their career goals, **or**
- Complete current or past post-baccalaureate relevant work experience of at least 10 weeks.

| Code | Title | Credit Hours |
|--|--|--------------|
| <i>Select up to 1 course from the following:</i> | | |
| RCEL 501 | ENGINEERING MANAGEMENT & LEADERSHIP THEORY AND APPLICATION | 0-3 |
| RCEL 502 | ENGINEERING PROJECT MANAGEMENT | |
| RCEL 503 | ENGINEERING PRODUCT MANAGEMENT IN INDUSTRY 4.0 | 0-3 |
| RCEL 504 | ETHICAL-TECHNICAL LEADERSHIP | |

RCEL 505 ENGINEERING ECONOMICS FOR
ENGINEERING LEADERS

Policies for the MDS Degree

Department of Computer Science Graduate Program Handbook

The General Announcements (GA) is the official Rice curriculum. As an additional resource for students, the department of Computer Science publishes a graduate program handbook, which can be found here: https://gradhandbooks.rice.edu/2023_24/Computer_Science_Masters_Handbook.pdf

Financial Aid

No financial aid is available from Rice University or the Computer Science Department for students in the MDS degree program.

Transfer Credit

For Rice University's policy regarding transfer credit, see [Transfer Credit \(https://ga.rice.edu/graduate-students/academic-policies-procedures/regulations-procedures-all-degrees/#transfer\)](https://ga.rice.edu/graduate-students/academic-policies-procedures/regulations-procedures-all-degrees/#transfer). Some departments and programs have additional restrictions on transfer credit. Students are encouraged to meet with their academic program's advisor when considering transfer credit possibilities.

Departmental Transfer Credit Guidelines

Students pursuing the MDS degree should be aware of the following departmental transfer credit guidelines:

- No more than 2 courses (6 credit hours) of credit from another U.S. or international universities of similar standing as Rice may apply towards the degree. Transfer coursework must be comparable in content and depth to the corresponding course at Rice, and must not have counted toward another degree.
- Request for transfer credit will be considered by the Computer Science Graduate Committee Chair, and the instructor of the equivalent Rice course.

Additional Information

For additional information, please see the *Graduate Programs* website at <https://www.cs.rice.edu/academics/graduate-programs> (<https://www.cs.rice.edu/academics/graduate-programs/>) or contact the department at gradapp@rice.edu.

Opportunities for the MDS Degree

Fifth-Year Master's Degree Option for Rice Undergraduate Students

In certain situations and with some terminal master's degree programs, Rice students have an option to pursue a master's degree by adding an additional fifth year to their four years of undergraduate studies.

Advanced Rice undergraduate students in good academic standing typically apply to the master's degree program during their junior or senior year. Upon acceptance, depending on course load, financial aid status, and other variables, they may then start taking some required courses of the master's degree program. A plan of study will need to be approved by the student's undergraduate major advisor and the master's degree program director.

As part of this option and opportunity, Rice undergraduate students:

- must complete the requirements for a bachelor's degree and the master's degree independently of each other (i.e. no course may be counted toward the fulfillment of both degrees).
- should be aware there could be financial aid implications if the conversion of undergraduate coursework to that of graduate level reduces their earned undergraduate credit for any semester below that of full-time status (12 credit hours).
- more information on this *Undergraduate - Graduate Concurrent Enrollment* opportunity, including specific information on the registration process can be found [here \(https://ga.rice.edu/undergraduate-students/academic-opportunities/undergraduate-graduate-concurrent-enrollment/\)](https://ga.rice.edu/undergraduate-students/academic-opportunities/undergraduate-graduate-concurrent-enrollment/).

Rice undergraduate students completing studies in science and engineering may have the option to pursue the Master of Data Science (MDS) degree. For additional information, students should contact their undergraduate major advisor and the MDS program director.

Additional Information

For additional information, please see the *Graduate Programs* website at <https://www.cs.rice.edu/academics/graduate-programs> (<https://www.cs.rice.edu/academics/graduate-programs/>) or contact the department at gradapp@rice.edu.