

# MASTER OF COMPUTER SCIENCE (MCS) DEGREE

## Program Learning Outcomes for the MCS Degree

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

1. Solve advanced Computer Science problems. Students will acquire and apply a graduate-level understanding of material in sub-areas of Computer Science.
2. Design and implement complex software systems. Students will demonstrate skill in their design and implementation and function effectively in teams.
3. Communicate effectively to a client and user.

## Requirements for the MCS Degree

The MCS 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 MCS degree must complete:

- A minimum of 30 credit hours to satisfy degree requirements.
- A minimum of 30 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 MCS degree program offers five areas of specialization:
  - [Artificial Intelligence](#) (p. 2), **or**
  - [Bioinformatics/Computational Biology](#) (p. 2), **or**
  - [Data Science and Machine Learning](#) (p. 3), **or**
  - [Management and Leadership](#) (p. 3), **or**
  - [Systems and Security](#) (p. 3).
- A 10 week-6 month internship. Students are responsible for obtaining and selecting an internship that best aligns with their career goals.
- 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 MCS degree is a terminal degree for students intending to pursue a technical career in the computer industry. MCS degree areas of specialization include artificial intelligence, bioinformatics/computational biology, data science and machine learning, management

and leadership, and systems and security. The MCS degree program normally requires three semesters of study.

Students in the MCS degree program are expected to pay full tuition and all fees. No financial aid is available from the university or the department for MCS students.

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 \(https://registrar.rice.edu/facstaff/degreeworks/officialcertifier/\)](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 MCS Degree		30

## Degree Requirements

Code	Title	Credit Hours
<b>Core Requirements</b> <sup>1, 2</sup>		
Theory		
<i>Select 1 course from the following:</i>		3-4
COMP 509	ADVANCED LOGIC IN COMPUTER SCIENCE	
COMP 514	OPTIMIZATION: ALGORITHMS, COMPLEXITY, AND APPROXIMATIONS	
COMP 523	INTRODUCTION TO MATHEMATICAL CRYPTOGRAPHY	
COMP 580	PROBABILISTIC ALGORITHMS AND DATA STRUCTURE	
COMP 581	AUTOMATA, FORMAL LANGUAGES, AND COMPUTABILITY	
COMP 582 / ELEC 512	GRADUATE DESIGN AND ANALYSIS OF ALGORITHMS	
Systems and Software		
<i>Select 1 course from the following:</i>		3-4
COMP 501	PRODUCTION PROGRAMMING	
COMP 534	PARALLEL COMPUTING	
COMP 539	SOFTWARE ENGINEERING METHODOLOGY	
COMP 541	INTRODUCTION TO COMPUTER SECURITY	
COMP 543	GRADUATE TOOLS AND MODELS - DATA SCIENCE	
COMP 556 / ELEC 556	INTRODUCTION TO COMPUTER NETWORKS	
COMP 621	SYSTEMS SOFTWARE	
Professional Skills		
<i>Select 1 course from the following:</i>		3
COMP 510	COMPUTER ETHICS	
COMP 566	AI ETHICS	
COMP 622	DATA ETHICS	

ENGI 501	WORKPLACE COMMUNICATION FOR PROFESSIONAL MASTER'S STUDENTS IN ENGINEERING	
ENGI 505 / CEVE 505	ENGINEERING ECONOMICS AND PROJECT MANAGEMENT	
ENGI 510	TECHNICAL AND MANAGERIAL COMMUNICATIONS	
ENGI 515	LEADING TEAMS AND INNOVATION	
ENGI 528 / CEVE 528	ENGINEERING ECONOMICS	
ENGI 529 / CEVE 529	ETHICS AND ENGINEERING LEADERSHIP	
ENGI 610 / NSCI 610	MANAGEMENT FOR SCIENCE AND ENGINEERING	
RCEL 501	ENGINEERING MANAGEMENT & LEADERSHIP THEORY AND APPLICATION	
RCEL 502	ENGINEERING PROJECT MANAGEMENT	
RCEL 503	ENGINEERING PRODUCT MANAGEMENT IN INDUSTRY 4.0	
RCEL 504	ETHICAL-TECHNICAL LEADERSHIP	
<b>Area of Specialization</b>		
Select 1 from the following Areas of Specialization (see Areas of Specialization below): <sup>2</sup>		9-12
Artificial Intelligence		
Bioinformatics/Computational Biology		
Data Science and Machine Learning		
Management and Leadership		
Systems and Security		
<b>Ten Week to Six Month Internship</b>		
A ten week to six month internship is required. <sup>3</sup>		
<b>Elective Requirements</b>		
Select an additional 6-12 credit hours from departmental (COMP) course offerings of at least 3 credit hours each at the 500-level or above to reach 30 total credit hours. <sup>2,4</sup>		6-12
<b>Total Credit Hours</b>		<b>30</b>

### Footnotes and Additional Information

- <sup>1</sup> Students demonstrating that they have passed one or more courses of comparable depth to a course listed for a core requirement area may petition to use one or more of those courses to waive requirements for that core requirement area.
- <sup>2</sup> 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.
- <sup>3</sup> Students are required to complete an approved 3-6 month internship. Students are responsible for obtaining an selecting an internship that best aligns with their career goals.

- <sup>4</sup> Students must complete 6-12 credit hours of Elective Requirements to reach 30 total credit hours. Elective coursework must be courses that are at least 3 credit hours each, at the graduate level (500-level or above), selected from departmental (COMP) course offerings. At most 3 credit hours may come from research type courses (e.g., COMP 590). Note that COMP coursework of at least 3 credit hours listed as Core Requirements or in the Areas of Specialization may be used as Elective Requirements, as long as they were not also used to satisfy the Core Requirements or Area of Specialization Requirements. Credit hours earned for ENGI 530 *Engineering Practicum* may not be applied toward MCS degree requirements.

### Areas of Specialization

Students must complete one of the following areas of specialization (9-12 credit hours). Approved areas of specialization appear below. Coursework not completed to satisfy Areas of Specialization may be used to fulfill the Elective Requirements.

#### Area of Specialization: Artificial Intelligence

Code	Title	Credit Hours
Select 3 courses from the following:		
COMP 509	ADVANCED LOGIC IN COMPUTER SCIENCE	9-12
COMP 546 / ELEC 546	INTRODUCTION TO COMPUTER VISION	
COMP 550 / ELEC 550 / MECH 550	ALGORITHMIC ROBOTICS	
COMP 552	REINFORCEMENT LEARNING	
COMP 557 / ELEC 557	ARTIFICIAL INTELLIGENCE	
COMP 560	COMPUTER GRAPHICS AND GEOMETRIC MODELING	
COMP 565	COMPUTATIONAL HUMAN-ROBOT INTERACTION	
COMP 598 / ELEC 598 / MECH 598	INTRODUCTION TO ROBOTICS	
COMP 646	DEEP LEARNING FOR VISION AND LANGUAGE	
COMP 650	PHYSICAL COMPUTING	
COMP 655	ADVANCED TOPICS IN ROBOTIC MANIPULATION;	
ELEC 545	INTRODUCTION TO DIGITAL IMAGE AND VIDEO PROCESSING	
ELEC 575	LEARNING FROM SENSOR DATA	
STAT 525	BAYESIAN STATISTICS	
<b>Total Credit Hours</b>		<b>9-12</b>

#### Area of Specialization: Bioinformatics/Computational Biology

Code	Title	Credit Hours
Select 3 courses from the following:		
BIOE 518	INTRODUCTION TO COMPUTATIONAL BIOLOGY	9-10
COMP 571	BIOINFORMATICS: SEQUENCE ANALYSIS	
COMP 572 / BIOE 564	BIOINFORMATICS: NETWORK ANALYSIS	

COMP 573	PROFESSIONAL DEVELOPMENT FOR BIOMEDICAL INFORMATICS
COMP 580	PROBABILISTIC ALGORITHMS AND DATA STRUCTURE
STAT 623	PROBABILITY IN BIOINFORMATICS AND GENETICS
<b>Total Credit Hours</b>	<b>9-10</b>

**Area of Specialization: Data Science and Machine Learning**

Code	Title	Credit Hours
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Select 3 courses from the following: 9-10

COMP 540	STATISTICAL MACHINE LEARNING
COMP 545	ADVANCED TOPICS IN OPTIMIZATION: FROM SIMPLE TO COMPLEX ML SYSTEMS
COMP 559	MACHINE LEARNING WITH GRAPHS
COMP 576 / ELEC 576	A PRACTICAL INTRODUCTION TO DEEP MACHINE LEARNING
COMP 631	INTRODUCTION TO INFORMATION RETRIEVAL
COMP 642	MACHINE LEARNING
COMP 646	DEEP LEARNING FOR VISION AND LANGUAGE
ELEC 515	MACHINE LEARNING FOR RESOURCE-CONSTRAINED PLATFORMS
ELEC 573	NETWORK SCIENCE AND ANALYTICS
ELEC 575	LEARNING FROM SENSOR DATA
<b>Total Credit Hours</b>	<b>9-10</b>

**Area of Specialization: Management and Leadership**

Code	Title	Credit Hours
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Select 3 courses from the following: 9

ENGI 505 / CEVE 505	ENGINEERING ECONOMICS AND PROJECT MANAGEMENT
ENGI 511	LEADING CHANGE - REVOLUTIONARY MOMENTS IN ENGINEERING AND SOCIETY
ENGI 515	LEADING TEAMS AND INNOVATION
RCEL 501	ENGINEERING MANAGEMENT & LEADERSHIP THEORY AND APPLICATION
RCEL 502	ENGINEERING PROJECT MANAGEMENT
RCEL 503	ENGINEERING PRODUCT MANAGEMENT IN INDUSTRY 4.0
RCEL 504	ETHICAL-TECHNICAL LEADERSHIP
RCEL 505	ENGINEERING ECONOMICS FOR ENGINEERING LEADERS
<b>Total Credit Hours</b>	<b>9</b>

**Area of Specialization: Systems and Security**

Code	Title	Credit Hours
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Select 3 courses from the following: 9-12

COMP 518	IOT PROGRAMMING AND DATA ANALYSIS
COMP 520 / ELEC 520	DISTRIBUTED SYSTEMS
COMP 522	MULTI-CORE COMPUTING

COMP 526 / ELEC 526	HIGH PERFORMANCE COMPUTER ARCHITECTURE
COMP 527	COMPUTER SYSTEMS SECURITY
COMP 530	DATABASE SYSTEM IMPLEMENTATION
COMP 536 / ELEC 510	SECURE AND CLOUD COMPUTING
COMP 628	CYBERSECURITY
<b>Total Credit Hours</b>	<b>9-12</b>

## Policies for the MCS 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](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 MCS 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 MCS 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. Transferred courses 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](mailto:gradapp@rice.edu).

## Opportunities for the MCS 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 Computer Science (MCS) degree. For additional information, students should contact their undergraduate major advisor and the MCS 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](mailto:gradapp@rice.edu).