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/). 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/).

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/). 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

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Total Credit Hours Required for the MCS Degree</td>
<td>30</td>
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Degree Requirements

Core Requirements 1, 2

<table>
<thead>
<tr>
<th>Theory</th>
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<tbody>
<tr>
<td>Select 1 course from the following:</td>
</tr>
<tr>
<td>COMP 509</td>
</tr>
<tr>
<td>COMP 514</td>
</tr>
<tr>
<td>COMP 523</td>
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<tr>
<td>COMP 580</td>
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<tr>
<td>COMP 581</td>
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<tr>
<td>COMP 582</td>
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</table>

Systems and Software

Select 1 course from the following: 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 | INTRODUCTION TO COMPUTER NETWORKS | ELEC 556 |
| COMP 621 | SYSTEMS SOFTWARE | |

Professional Skills

Select 1 course from the following: 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

Area of Specialization

Select 1 from the following Areas of Specialization (see Areas of Specialization below): 2

- Artificial Intelligence
- Bioinformatics/Computational Biology
- Data Science and Machine Learning
- Management and Leadership
- Systems and Security

Ten Week to Six Month Internship

A ten week to six month internship is required. 3

Elective Requirements

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. 2, 4

Total Credit Hours 30

Footnotes and Additional Information

1 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.

2 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.

3 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.

4 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.

Elective coursework not completed to satisfy Areas of Specialization may be used to fulfill the Elective Requirements.

Area of Specialization: Artificial Intelligence

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

Area of Specialization: Bioinformatics/Computational Biology

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<tr>
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<th>Title</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>BIOE 518</td>
<td>INTRODUCTION TO COMPUTATIONAL BIOLOGY</td>
<td>9-10</td>
</tr>
<tr>
<td>COMP 571</td>
<td>BIOINFORMATICS: SEQUENCE ANALYSIS</td>
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<tr>
<td>COMP 572</td>
<td>BIOINFORMATICS: NETWORK ANALYSIS</td>
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</table>

Total Credit Hours 9-12
Master of Computer Science (MCS) Degree

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<thead>
<tr>
<th>Code</th>
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<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP 573</td>
<td>PROFESSIONAL DEVELOPMENT FOR BIOMEDICAL INFORMATICS</td>
<td>9-10</td>
</tr>
<tr>
<td>COMP 580</td>
<td>PROBABILISTIC ALGORITHMS AND DATA STRUCTURE</td>
<td></td>
</tr>
<tr>
<td>STAT 623</td>
<td>PROBABILITY IN BIOINFORMATICS AND GENETICS</td>
<td></td>
</tr>
</tbody>
</table>

**Total Credit Hours:** 9-10

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

Select 3 courses from the following:

- 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

**Total Credit Hours:** 9-10

**Area of Specialization: Management and Leadership**

Select 3 courses from the following:

- 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 LEADERS

**Total Credit Hours:** 9

**Area of Specialization: Systems and Security**

Select 3 courses from the following:

- 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

**Total Credit Hours:** 9-12

**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.

**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/).

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.