

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. 4) tab.
- The requirements for one area of specialization (see below for areas of specialization). The MCS degree program offers twelve areas of specialization:
 - [AI and Robotics](#) (p. 2), **or**
 - [Architecture](#) (p. 2), **or**
 - [Compilers](#) (p. 2), **or**
 - [Computer Vision](#) (p. 2), **or**
 - [Data Science](#) (p. 3), **or**
 - [Database](#) (p. 3), **or**
 - [Networking](#) (p. 3), **or**
 - [Optimization](#) (p. 3), **or**
 - [Parallel Computing](#) (p. 3), **or**
 - [PL Theory and Logic](#) (p. 3), **or**
 - [Software Engineering](#) (p. 3), **or**
 - [Systems and Security](#) (p. 3).¹
- 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 and robotics, computer vision, data science, databases, operating systems and security, computer networks, computer architecture, parallel computing, compiler construction, programming languages, and software engineering. 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
Core Requirements ²		
Databases		
Select 1 course from the following:		3-4
COMP 530	DATABASE SYSTEM IMPLEMENTATION	
COMP 533	INTRODUCTION TO DATABASE SYSTEMS	
COMP 543	GRADUATE TOOLS AND MODELS - DATA SCIENCE	
COMP 553	BIG DATA MANAGEMENT FOR DATA SCIENCE	
Theory		
Select 1 course from the following:		3-4
COMP 580	PROBABILISTIC ALGORITHMS AND DATA STRUCTURE	
COMP 582 / ELEC 512	GRADUATE DESIGN AND ANALYSIS OF ALGORITHMS	
COMP 682	PRINCIPLES OF ALGORITHMS AND SOFTWARE AREA	
Area of Specialization		
Select 1 from the following Areas of Specialization (see Areas of Specialization below):		6-8
AI and Robotics		
Architecture		
Compilers		

Computer Vision
Data Science
Database
Networking
Optimization
Parallel Computing
PL Theory and Logic
Software Engineering
Systems and Security
Design Project ³
Select 1 course from the following: 3-4
COMP 504 GRADUATE OBJECT-ORIENTED PROGRAMMING AND DESIGN
COMP 539 SOFTWARE ENGINEERING METHODOLOGY
COMP 590 COMPUTER SCIENCE PROJECTS ³
Ten Week to Six Month Internship
A ten week to six month internship is required. ⁴
Elective Requirements
Select an additional 10-15 credit hours from departmental (COMP) course offerings at the 500-level or above to reach 30 total credit hours. ⁵ 10-15
Total Credit Hours 30

Footnotes and Additional Information

- ¹ These specializations are representative, but not comprehensive. Students may design their own specialization with approval by the MCS advisor.
- ² 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.
- ³ MCS advisor approval is required to use COMP 590 *Computer Science Projects* to satisfy the MCS design project requirement. To be eligible to satisfy the MCS design project requirement, the proposed COMP 590 project must include a significant programming design and implementation effort.
- ⁴ 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.
- ⁵ Elective coursework must be approved professional development coursework (see below) and/or 500-level or above departmental (COMP) course offerings other than independent study projects (e.g. COMP 590). At most, 3 credit hours total, of 1-credit-hour and 2-credit-hour courses, may be applied toward MCS degree requirements. Up to 6 credit hours of professional development courses may be applied toward MCS degree requirements. See below for a list of approved professional development courses. Credit hours earned for ENGI 530 *Engineering Practicum* may not be applied toward MCS degree requirements.

Areas of Specialization

Students must complete a tightly coupled two-course area of specialization (6-8 credit hours). Approved specialization areas appear below. Student-designed specialization areas are permitted if approved by the student's MCS advisor. Custom specialization areas may include coursework from departments other than Computer Science (COMP) and may include one independent study project (e.g. COMP 590).

Area of Specialization: AI and Robotics

Code	Title	Credit Hours
Select 2 courses from the following: 6-8		
COMP 502 / ELEC 502 / STAT 502	NEURAL MACHINE LEARNING I	
COMP 540	STATISTICAL MACHINE LEARNING	
COMP 542	LARGE-SCALE MACHINE LEARNING	
COMP 550 / ELEC 550 / MECH 550	ALGORITHMIC ROBOTICS	
COMP 557 / ELEC 557	ARTIFICIAL INTELLIGENCE	
COMP 576 / ELEC 576	A PRACTICAL INTRODUCTION TO DEEP MACHINE LEARNING	
COMP 602 / ELEC 602 / STAT 602	NEURAL MACHINE LEARNING AND DATA MINING II	
Total Credit Hours		6-8

Area of Specialization: Architecture

Code	Title	Credit Hours
Select 2 courses from the following: 7-8		
COMP 526 / ELEC 526	HIGH PERFORMANCE COMPUTER ARCHITECTURE	
COMP 535	APPROXIMATE COMPUTING SYSTEM FOR BIG DATA, SUPERCOMPUTING AND EMBEDDED SYSTEMS	
COMP 554 / ELEC 554	COMPUTER SYSTEMS ARCHITECTURE	
Total Credit Hours		7-8

Area of Specialization: Compilers

Code	Title	Credit Hours
Select 2 courses from the following: 7-8		
COMP 506	COMPILER CONSTRUCTION FOR GRADUATE STUDENTS	
COMP 512	ADVANCED COMPILER CONSTRUCTION	
COMP 515	ADVANCED COMPILATION FOR VECTOR PARALLEL PROCESSORS	
Total Credit Hours		7-8

Area of Specialization: Computer Vision

Code	Title	Credit Hours
Select 2 courses from the following: 6-7		
COMP 546 / ELEC 546	INTRODUCTION TO COMPUTER VISION	
COMP 560	COMPUTER GRAPHICS AND GEOMETRIC MODELING	
ELEC 549	COMPUTATIONAL PHOTOGRAPHY	
Total Credit Hours		6-7

Area of Specialization: Data Science

Code	Title	Credit Hours
<i>Select 2 courses from the following:</i> 6-8		
COMP 502 / ELEC 502 / STAT 502	NEURAL MACHINE LEARNING I	
COMP 530	DATABASE SYSTEM IMPLEMENTATION	
COMP 533	INTRODUCTION TO DATABASE SYSTEMS	
COMP 540	STATISTICAL MACHINE LEARNING	
COMP 542	LARGE-SCALE MACHINE LEARNING	
COMP 576 / ELEC 576	A PRACTICAL INTRODUCTION TO DEEP MACHINE LEARNING	
COMP 602	NEURAL MACHINE LEARNING AND DATA MINING II	
Total Credit Hours		6-8

Area of Specialization: Database

Code	Title	Credit Hours
COMP 530	DATABASE SYSTEM IMPLEMENTATION	3-4
COMP 533	INTRODUCTION TO DATABASE SYSTEMS	3
Total Credit Hours		6-7

Area of Specialization: Networking

Code	Title	Credit Hours
<i>Select 2 courses from the following:</i> 8		
COMP 524 / ELEC 524	MOBILE AND WIRELESS NETWORKING	
COMP 529 / ELEC 529	ADVANCED COMPUTER NETWORKS	
COMP 556 / ELEC 556	INTRODUCTION TO COMPUTER NETWORKS	
Total Credit Hours		8

Area of Specialization: Optimization

Code	Title	Credit Hours
<i>Select 2 courses from the following:</i> 6		
CAAM 560	OPTIMIZATION THEORY	
CAAM 564	NUMERICAL OPTIMIZATION	
CAAM 565	CONVEX OPTIMIZATION	
Total Credit Hours		6

Area of Specialization: Parallel Computing

Code	Title	Credit Hours
<i>Select 2 courses from the following:</i> 6-7		
COMP 515	ADVANCED COMPILATION FOR VECTOR PARALLEL PROCESSORS	
COMP 522	MULTI-CORE COMPUTING	
COMP 534	PARALLEL COMPUTING	
Total Credit Hours		6-7

Area of Specialization: PL Theory and Logic

Code	Title	Credit Hours
<i>Select 2 courses from the following:</i> 8		
COMP 507	COMPUTER-AIDED PROGRAM DESIGN	
COMP 509	ADVANCED LOGIC IN COMPUTER SCIENCE	
COMP 511	PRINCIPLES OF PROGRAMMING LANGUAGES	
Total Credit Hours		8

Area of Specialization: Software Engineering

Code	Title	Credit Hours
<i>Select 2 courses from the following:</i> 7-8		
COMP 501	PRODUCTION PROGRAMMING	
COMP 504	GRADUATE OBJECT-ORIENTED PROGRAMMING AND DESIGN	
COMP 505	ADVANCED TOPICS IN OBJECT-ORIENTED DESIGN	
COMP 539	SOFTWARE ENGINEERING METHODOLOGY	
Total Credit Hours		7-8

Area of Specialization: Systems and Security

Code	Title	Credit Hours
<i>Select 2 courses from the following:</i> 6-8		
COMP 508 / ELEC 511	DESIGN AND ANALYSIS OF SECURE EMBEDDED SYSTEMS FOR IoT ERA	
COMP 521 / ELEC 552	OPERATING SYSTEMS AND CONCURRENT PROGRAMMING	
COMP 528	INTRODUCTION TO VIRTUALIZATION	
COMP 532	INTRODUCTION TO DISTRIBUTED COMPUTER SYSTEMS	
COMP 538 / ELEC 528	SECURITY OF HW EMBEDDED SYSTEMS	
COMP 541	INTRODUCTION TO COMPUTER SECURITY	
ELEC 553	MOBILE AND EMBEDDED SYSTEM DESIGN AND APPLICATION	
Total Credit Hours		6-8

Professional Development

Students may take up to 6 credit hours from the following approved Professional Development coursework, which is encouraged, but not required.

Code	Title	Credit Hours
<i>Select up to 2 courses from the following:</i> 0-6		
COMP 694 / ELEC 694	HOW TO BE A CHIEF TECHNOLOGY OFFICER	
ENGI 501	WORKPLACE COMMUNICATION FOR PROFESSIONAL MASTER'S STUDENTS IN ENGINEERING	
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 542	PROFESSIONAL COMMUNICATION FOR ENGINEERING LEADERS
ENGI 610 / NSCI 610	MANAGEMENT FOR SCIENCE AND ENGINEERING
ENGI 614	LEARNING HOW TO INNOVATE?
ENGI 615	LEADERSHIP COACHING FOR ENGINEERS

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/2021_22/Computer_Science_Graduate_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/) (<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

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