

# Combined Advanced Degree in Computer Science Program Guide

## Academic Program Guide for **New First-Year Students** (Effective 2021) Department of Computer Science ([computerscience@rowan.edu](mailto:computerscience@rowan.edu))

*Students who entered Rowan University prior to Fall 2018 should follow the guide for their program and start year in consultation with their advisor.*

### Rowan University Graduation Requirements for all Majors / Degrees

- Students must complete at least 120 semester hours (sh) of coursework that apply to their Rowan University degree.
- Students must have a cumulative GPA of at least 2.0 in Rowan University coursework. (Transfer courses/credit do not count toward the RU GPA.)
- A minimum of 30 sh of coursework must be completed at/through Rowan University.
- Only grades of "D-" or above may apply to graduation/degree requirements. (Some programs may set higher minimums.)
- Students must meet the Rowan Core and Rowan Experience Requirements.
- Students must apply for graduation and should do so for the term in which they will complete all program requirements.

### Program-Specific Graduation Requirements for this Major / Degree

- A grade of C- or better in Calculus I, Discrete Structures, Introduction to Object Oriented Programming, Object Oriented Programming/Data Abstraction, Computer Organization, and Data Structures and Algorithms is required for graduation and to take any course that have the above courses as a prerequisite. This policy applies whether these courses are taken locally or transferred.
- Graduate courses may be counted as restricted electives when takes as senior privilege or part of the accelerated BS/MS degree program.

### Rowan Core Requirements<sup>1</sup>

*Students must satisfy all six Rowan Core Literacies. A minimum total of 3 sh of coursework is required to satisfy each Literacy.*

*With the exception of the 9 sh counted here for Communicative Literacy, credits attached to the courses in this section will apply elsewhere.*

- (COML) Communicative Literacy: *Must be met by the following three courses or their official equivalents:*
- COMP 01111 College Composition I (3 sh)     COMP 01112 College Composition II (3 sh)     CMS 04205 Public Speaking (3 sh)\*
- \*CMS 04205 is required as pre-requisite for one or more major courses in this program. Therefore, CMS 04205 or its transferred equivalent must be taken to fulfill this degree**
- (ARTL) Artistic Literacy                      *Recommendation from major:*
- (GLBL) Global Literacy                         *Recommendation from major:*
- (HUML) Humanistic Literacy                 *Recommendation from major:*
- (QNTL) Quantitative Literacy                 *Recommendation from major:* MATH 01130 (4 sh counted under non-program)
- (SCIL) Scientific Literacy                      *Recommendation from major:* BIOL 01104, CHEM 06100 or PHYS 00220 (4 sh counted under non-program)

Subtotal of credits counted in this section: 9 sh

### Rowan Experience Requirements

*Students must satisfy all three Rowan Experience attributes. Credits attached to the courses in this section will apply elsewhere.*

- (LIT) Broad-Based Literature Attribute    *Recommendation from major:*
- (WI) Writing Intensive Attribute            *Recommendation from major:* WA 01302 Technical Writing (3 sh counts under non-program)
- (RS) Rowan Seminar Attribute<sup>2</sup>            *Recommendation from major:*

### Non-Program Courses (minimum 18 sh)

*Courses in this section cannot be in the major department.*

Course #	Course Name	Course Attributes / Notes	Sem/Yr	Grade	Credits
INTR 01265	Computers and Society	Satisfies Humanistic Literacy			3
MATH 01130	Calculus I	Satisfies Quantitative Literacy			4
BIOL 01104, CHEM 06100 or PHYS 00220	Introduction to Evolution and Scientific Inquiry, Chemistry I or Introductory Mechanics	Satisfies Scientific Literacy			4
WA 01302	Technical Writing	Writing Intensive			3
	Authorized Lab Science course for CS majors	See list at end of program guide			4
<b>Subtotal: 18 sh</b>					

<sup>1</sup> The Rowan Core requirements are waived for transfer students with an earned A.A. or A.S. degree from a NJ community/county college.

<sup>2</sup> The Rowan Seminar requirement is waived for all students transferring 24 or more approved credits into Rowan University at the time of initial entry.

## Major Requirements (64 sh)

### SUMMARY OF MAJOR REQUIREMENTS

- 33 sh of Foundational Courses
  - 19 sh of Upper-Level and Capstone Courses
  - 12 sh of Computer Science Restricted Electives
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- 64 sh total

### FOUNDATIONAL COURSES

Course #	Course Name	Course Attributes / Notes	Sem/Yr	Grade	Credits
CS 00100	Computer Science Learning Community				1
CS 01205	Computer Lab Techniques				3
MATH 03160	Discrete Structures				3
MATH 01131	Calculus II				4
MATH 01210	Linear Algebra				3
STAT 02290	Probability and Statistical Inference for Computing Systems				3
CS 04113	Introduction to Object-Oriented Programming	students must be ready for MATH 01130			4
CS 04114	Object-Oriented Programming & Data Abstraction				3
CS 04222	Data Structures and Algorithms				4
CS 06205	Computer Organization				3
CS 07210	Foundations of Computer Science				3
<b>Subtotal:</b>					<b>33</b>

### UPPER-LEVEL AND CAPSTONE COURSES

Course #	Course Name	Course Attributes / Notes	Sem/Yr	Grade	Credits
CS 04315	Programming Languages				3
CS 04390	Operating Systems				3
CS 04400	Senior Project				3
CS 07321	Software Engineering I - WI				4
CS 07340	Design and Analysis of Algorithms				3
CS 07351	Cybersecurity: Fundamentals, Principles, and Applications				3
<b>Subtotal:</b>					<b>19</b>

### COMPUTER SCIENCE RESTRICTED ELECTIVES

Choose 12 credits from the courses in Banks 1 and 2 below.

#### **Bank One (at least one Restricted Elective must be selected from this bank of courses)**

	Course #	Course Name	Course Attributes / Notes	Sem/Yr	Grade	Credits
<input type="radio"/>	CS 04394	Distributed Systems				3
<input type="radio"/>	CS 04430	Database Systems: Theory and Program				3
<input type="radio"/>	CS 06410	Data Communications and Networking				3
<input type="radio"/>	CS 06440	Cloud Computing and the Internet of Things				3
<input type="radio"/>	CS 07480	Intro to Data Mining				3

**Bank Two**

	Course #	Course Name	Course Attributes / Notes	Sem/Yr	Grade	Credits
<input type="radio"/>	CS 01395	Topics in Computer Science	multiple sections of this course with different topics can be taken.			3
<input type="radio"/>	CS 01400	Independent Study	can be counted as a single 3-hour restricted elective with the approval of the student's mentor/course advisor.			3
<input type="radio"/>	CS 02421	Big Data Tools and Techniques				3
<input type="radio"/>	CS 04301	Bioinformatics - Computational Aspects				3
<input type="radio"/>	CS 04305	Web Programming				3
<input type="radio"/>	CS 04350	Blockchain Programming				3
<input type="radio"/>	CS 04372	Advanced Android Programming				3
<input type="radio"/>	CS 04376	Advanced IOS Programming				3
<input type="radio"/>	CS 04380	Object Oriented Design				3
<input type="radio"/>	CS 04391	Parallel and Concurrent Programming				3
<input type="radio"/>	CS 04392	System Programming and OS Internals				3
<input type="radio"/>	CS 04401	Compiler Design				3
<input type="radio"/>	CS 04440	Data Warehousing				3
<input type="radio"/>	CS 04471	Topics in Mobile Programming				3
<input type="radio"/>	CS 06310	Principles of Digital Computers				3
<input type="radio"/>	CS 06390	Introduction to Systems Simulation and Modeling				3
<input type="radio"/>	CS 06412	Advanced Computer Architecture				3
<input type="radio"/>	CS 06415	Wireless Networks, Protocols and Apps.				3
<input type="radio"/>	CS 06416	TCP/IP and Internet Protocols and Tech.				3
<input type="radio"/>	CS 06417	Principles of Network Security				3
<input type="radio"/>	CS 06420	Embedded Systems Programming				3
<input type="radio"/>	CS 06447	Introduction to IoT Upper Stack				3
<input type="radio"/>	CS 06470	Cyber Operations				3
<input type="radio"/>	CS 07310	Robotics				3
<input type="radio"/>	CS 07322	Software Engineering II				3
<input type="radio"/>	CS 07350	Computer Cryptography				3
<input type="radio"/>	CS 07353	Security of Mobile Devices				3
<input type="radio"/>	CS 07360	Introduction to Computer Graphics				3
<input type="radio"/>	CS 07370	Introduction to Information Visualization				3
<input type="radio"/>	CS 07380	Introduction to Computer Animation				3
<input type="radio"/>	CS 07390	Intro to Computer Game Design and Development				3
<input type="radio"/>	CS 07422	Theory of Computing				3
<input type="radio"/>	CS 07430	Human Computer Interaction				3
<input type="radio"/>	CS 07450	Artificial Intelligence				3
<input type="radio"/>	CS 07455	Machine Learning				3
<input type="radio"/>	CS 07460	Computer Vision				3
<input type="radio"/>	CS 07485	Web and Text Mining				3
<input type="radio"/>	CS 99300	Computer Field Experience	Permission of instructor required. Field experience may be from 3 to 12 credits; however only 3 credits can apply to the program requirements.			3
<input type="radio"/>	CS 99310	Advanced Learning Asst Experience in CS	Permission of instructor required.			3
<input type="radio"/>	CS 99490	Computer Science Research II				3
<b>Subtotal</b>						<b>12</b>

*SUMMARY OF GRADUATION REQUIREMENTS*

- 64 sh of Program Requirements
- 27 sh of Rowan Core and Rowan Experience
- 29 sh of Free Electives

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- 120 sh total



# MS in Computer Science Degree Program

## Program Requirements

The M.S. in Computer Science is a 30 credit-hour program with an optional thesis track. Ten distinct courses must be taken to fulfill the Master's Degree. Any course taken that belongs in multiple categories cannot double count. Up to two courses may be taken from other, appropriate graduate programs subject to advisor approval, provided all requirements for this MS degree are fulfilled.

### Tracks:

The program includes two tracks – a thesis track and a non-thesis track.

- **Non-Thesis Track:** Students choosing the non-thesis track take 30 credits of traditional (non-thesis) courses.
- **Thesis Track:** Students choosing the thesis track will also take 30 credits, but they will substitute between 6 to 9 credits of thesis courses for traditional (non-thesis) courses,

### Algorithms Core:

- All students must complete a 3 credit Algorithms Core course

### Common Core:

- All students must complete 9-credits of Common Core courses.

### Advanced Courses:

- All students must complete 9-credits of advanced (600 level) courses. Thesis II and Thesis III courses will fulfill this requirement for thesis-track students.

## Required Courses – 3 s.h.

Course #	Course Name	Course Attributes / Notes	Sem/Yr	Grade	Credits
CS 07540	Advanced Design & Analysis of Algorithms				3
					Subtotal: 3 s.h.

## Core Courses – 9 s.h.

Students are required to complete at least one course in each of any **three of the five** Common Core areas below:

### Algorithms and Theory

Course #	Course Name	Notes	Sem/Yr	Grade	Credits
CS 07510	Mathematical Foundations of Computer Science				3
CS 07556	Machine Learning I				3
CS 07622	Advanced Theory of Computing	Counts as advanced course			3
CS 07650	Concepts in Artificial Intelligence	Counts as advanced course			3
CS 07652	Cryptographic Algorithms†	Counts as advanced course			3
CS 07656	Machine Learning II	Counts as advanced course			3

### Software Design

Course #	Course Name	Notes	Sem/Yr	Grade	Credits
CS 04515	Embedded Systems Programming				3
CS 04524	Agile Software Engineering				3
CS 04563	Concurrent Programming-Theory and Practice				3
CS 04580	Human Centered Computing				3
CS 04623	Advanced Software Engineering	Counts as advanced course			3
CS 04670	Advanced Object Oriented Design	Counts as advanced course			3

## Cybersecurity

Course #	Course Name	Notes	Sem/Yr	Grade	Credits
CS 03551	Advanced Cyber Security: Principles & Applications				3
CS 03570	Cyber Defense of Operating Systems and Networks				3
CS 03580	Cloud Computing and the Internet of Things - Architectures and Security†				3
CS 07652	Cryptographic Algorithms†	Counts as advanced course			3
CS 09612	Network Security†	Counts as advanced course			3

## Data Management and Analytics

Course #	Course Name	Notes	Sem/Yr	Grade	Credits
CS 02505	Data Mining I				3
CS 02530	Advanced Database Systems: Theory and Programming				3
CS 02605	Data Mining II	Counts as advanced course			3
CS 02620	Data Warehousing	Counts as advanced course			3
CS 02625	Data Quality & Web Text Mining	Counts as advanced course			3
CS 02630	Advanced Topics in Database Systems	Counts as advanced course			3

## Computer Networks

Course #	Course Name	Notes	Sem/Yr	Grade	Credits
CS 03580	Cloud Computing and the Internet of Things - Architectures and Security†				3
CS 09510	Computer Networks				3
CS 09605	Wireless Networks & Systems	Counts as advanced course			3
CS 09612	Network Security†	Counts as advanced course			3
CS 09675	Advanced TCP/IP & Internet Protocols & Technologies	Counts as advanced course			3

†course can count from one of two course areas but cannot count for both core areas

## Advanced Courses – 9 s.h.

Students must complete three 600-level courses to obtain the Master's Degree. Note: These courses are listed throughout this Program Guide and can fulfill a core course requirement, as well, so long as ten distinct courses have been taken.

## Remaining Courses – 9 s.h.

### Thesis-track

Students may take either 6 credits of thesis and 1 elective, or they may take 9 credits of thesis. If thesis track is chosen, students must successfully complete and defend a Master's Thesis.

Course #	Course Name	Notes	Sem/Yr	Grade	Credits
CS 07530	Computer Science Thesis I				3
CS 07631	Computer Science Thesis II				3
CS 07632	Computer Science Thesis III (optional)				3
					Subtotal: 6-9 s.h.

### Non thesis-track

Students must take 9 credits of electives, they may not take any thesis courses. Electives can be chosen from the core banks as well.

Course #	Course Name	Notes	Sem/Yr	Grade	Credits
CS 01541	Bioinformatics - Advanced Computational Aspects				3
CS 02570	Information Visualization				3
CS 04548	Programming Languages: Theory, Implementation & Application				3
CS 04564	Compiler Design Theory				3
CS 04565	System Programming				3
CS 04571	Advanced Topics in Mobile Programming				3
CS 04590	Computer Game Design & Development				3

CS 04605	Advanced Web Programming	Counts as advanced course			3
CS 06520	Topics in Computer Architecture				3
CS 06560	Design & Implementation of Operating Systems				3
CS 07565	Computer Vision				3
CS 07595	Advanced Topics in Computer Science				3
CS 07645	Advanced Robotics	Counts as advanced course			3
CS 07655	Natural Language Processing	Counts as advanced course			3
CS 08560	Computer Graphics				3
CS 08680	Computer Animation	Counts as advanced course			3
Subtotal: 9 s.h.					

### Any core course can be taken as an elective.

Students can choose a **maximum** of 6 credits of **approved** graduate electives from graduate programs in the field of Electrical and Computer Engineering, Mathematics, Management Information Systems, Data Analytics, or Bioinformatics. Only 3 credits from the graduate program in Management Information Systems could be counted towards electives for a graduate degree in Computer Science.

Any graduate course taken outside of Rowan-CS must be **approved** prior to registration by the CS Graduate Program Committee. Such an approval is on an individual basis. The interested student must submit in writing to the CS Graduate Program Coordinator an explanation as to why they are interested in the course and how the course addresses one or more of the goals of the MS in Computer Science program. The student can expect a response from the Graduate Committee within 10 business days.

### The MS in Computer Science Program Goals

- **Program Goal 1:** MS Computer Science graduates understand core areas of Computer Science and apply this knowledge to solving computing problems.
- **Program Goal 2:** MS Computer Science graduates are able to design, analyze, implement and evaluate computer systems and applications.
- **Program Goal 3:** MS Computer Science graduates communicate effectively.
- **Program Goal 4:** MS Computer Science graduates are prepared to engage in continuing professional development and research.

### Project Intensive Designation

The course instructor may choose to designate a course as “Project Intensive.” Project intensive courses contain a significant project component that contributes to the students’ final grade. Students choosing the non-thesis option must take at least two project intensive courses. The current list can be found at [Project Intensive Courses](#).

## Graduate Course Offering

The graduate course offerings can be found at [Section Tally](#) by choosing the appropriate semester, as department “CSCI- Computer Science” and as attribute “GRAD – Graduate Lvl crses 500 and up”. Students can only register for courses that are offered on the Main and Camden campuses. The Camden campus is easily accessible from the main campus by free Rowan University shuttle. The catalog description of the courses offered can be found by clicking on the course CRN. Students cannot register for courses offered as part of our extension programs.

## Ensuring Academic Success

The success of our graduate students is essential to the Computer Science Department and to Rowan University. Therefore, in order to ensure progress towards graduation and academic success, it is important for CADP in CS students to stay in regular contact with the Graduate

Program Coordinator and to get advice on courses, to check academic progress as well as communicate any concerns, questions or general student issues. Do not hesitate to contact Dr. Xu at [xu@rowan.edu](mailto:xu@rowan.edu).

It is the students’ responsibility to make sure that they have the necessary background for every course they take. In order to ensure that, the students are encouraged to contact the instructor of the course to enquire about the expected necessary background. If a student is lacking the necessary background for a course, it is the student’s responsibility to supplement with self-study in preparation for the course.

## Thesis Requirements

Rowan students pursuing a *thesis-track* MS in Computer Science degree have to write and defend a thesis. In addition, as part of their fulfillment for graduation, are required to submit their thesis to the Office of Graduate Research Services for final format approval. The Office of Graduate Research Services coordinates the final format review process and is responsible for ensuring that all theses adhere to the format and style as prescribed in the [Thesis & Dissertation Manual](#) prior to final approval with the Registrar for graduation purposes.

For information regarding thesis final format review please see: <https://rowanu.com/thesis>.