Combined Advanced Degree
B.S. Computer Science/M.S. Data Science

Academic Program Guide for **New First-Year Students** (Effective 2021)
Department of Computer Science (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[1]

*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)

◯ (ARTL) Artistic Literacy *Recommendation from major:*
◯ (GLBL) Global Literacy *Recommendation from major:*
◯ (HUML) Humanistic Literacy *Recommendation from major:* INTR 01265 (3 sh counted under non-program)
◯ (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[2] *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
				Subtotal: 18 sh	

[1] The Rowan Core requirements are waived for transfer students with an earned A.A. or A.S. degree from a NJ community/county college.
[2] 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
- 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
				Subtotal:	33

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				4
CS 07340	Design and Analysis of Algorithms				3
CS 07351	Cybersecurity: Fundamentals, Principles, and Applications				3
				Subtotal:	19

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
○	CS 04394	Distributed Systems				3
○	CS 04430	Database Systems: Theory and Program				3
○	CS 06410	Data Communications and Networking				3
○	CS 06440	Cloud Computing and the Internet of Things				3
○	CS 07480	Intro to Data Mining				3

Bank Two

	Course #	Course Name	Course Attributes / Notes	Sem/Yr	Grade	Credits
○	CS 01395	Topics in Computer Science	multiple sections of this course with different topics can be taken.			3
○	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
○	CS 02421	Big Data Tools and Techniques				3
○	CS 04301	Bioinformatics - Computational Aspects				3
○	CS 04305	Web Programming				3
○	CS 04350	Blockchain Programming				3
○	CS 04372	Advanced Android Programming				3
○	CS 04376	Advanced IOS Programming				3
○	CS 04380	Object Oriented Design				3
○	CS 04391	Parallel and Concurrent Programming				3
○	CS 04392	System Programming and OS Internals				3
○	CS 04401	Compiler Design				3
○	CS 04440	Data Warehousing				3
○	CS 04471	Topics in Mobile Programming				3
○	CS 06310	Principles of Digital Computers				3
○	CS 06390	Introduction to Systems Simulation and Modeling				3
○	CS 06412	Advanced Computer Architecture				3
○	CS 06415	Wireless Networks, Protocols and Apps.				3
○	CS 06416	TCP/IP and Internet Protocols and Tech.				3
○	CS 06417	Principles of Network Security				3
○	CS 06420	Embedded Systems Programming				3
○	CS 06447	Introduction to IoT Upper Stack				3
○	CS 06470	Cyber Operations				3
○	CS 07310	Robotics				3
○	CS 07322	Software Engineering II				3
○	CS 07350	Computer Cryptography				3
○	CS 07353	Security of Mobile Devices				3
○	CS 07360	Introduction to Computer Graphics				3
○	CS 07370	Introduction to Information Visualization				3
○	CS 07380	Introduction to Computer Animation				3
○	CS 07390	Intro to Computer Game Design and Development				3
○	CS 07422	Theory of Computing				3
○	CS 07430	Human Computer Interaction				3
○	CS 07450	Artificial Intelligence				3
○	CS 07455	Machine Learning				3
○	CS 07460	Computer Vision				3
○	CS 07485	Web and Text Mining				3
○	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
○	CS 99310	Advanced Learning Asst Experience in CS	Permission of instructor required.			3
○	CS 99490	Computer Science Research II				3
				Subtotal		12

Summary of Graduation Requirements

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

Free Electives for this Major/Degree (29 sh)

Students should choose Free Electives that satisfy any Rowan Core or Rowan Experience requirements that are not fulfilled by Major or Non-Program courses.

Course #	Course Name	Course Attributes / Notes	Sem/Yr	Grade	Credits
				Subtotal:	29 sh

Total Program Credits Required for this Major / Degree: 120 SH

Authorized Lab Science Courses for Computer Science Majors

(4 sh counted under Non-Program Courses)

	Course #	Course Name	Course Attributes / Notes	Sem/Yr	Grade	Credits
○	ASTR 11220	Observational Astronomy				4
○	ASTR 11230	Introductory Astronomy and Astrophysics				4
○	BIOL 01104	Introduction to Evolution & Scientific Inquiry				4
○	BIOL 01106	Introduction to Genetics				4
○	BIOL 01203	Introduction to Cell Biology				4
○	BIOL 10210	Human Anatomy and Physiology I				4
○	BIOL 10212	Human Anatomy and Physiology II				4
○	BINF 07250	Introduction to Bioinformatics				4
○	MCB 01101	Foundations in Biology for Biomedical Sciences I				4
○	PHYS 00220	Introductory Mechanics				4
○	PHYS 00221	Intro. Thermodynamics, Fluids, Waves, & Optics				4
○	PHYS 00222	Introductory Electricity and Magnetism				4
○	PHYS 00300	Modern Physics				4
○	PHYS 00325	Electric Circuits				4
○	PHYS 00340	Optics and Light				4
○	CHEM 06100	Chemistry I				4
○	CHEM 06101	Chemistry II				4
○	CHEM 09250	Quantitative Analysis				4
○	CHEM 07200	Organic Chemistry I				4

MS in Data Science Degree Program

Program Requirements

The M.S. in Data Science consists of 10 courses totalling 30 graduate semester hours (s.h.). Students may enroll in this program part-time or full-time.

Required Courses – 6 s.h.

Course #	Course Name	Notes	Sem/Yr	Grade	Credits
CS 02505	Data Mining I				3
STAT 02515	Applied Multivariate Data Analysis				3
				Subtotal: 6 s.h.	

Core Courses – 9 s.h.

Students must select any three of these core courses

Course #	Course Name	Notes	Sem/Yr	Grade	Credits
CS 02516	Big Data Tools and Techniques				3
CS 02620	Data Warehousing				3
CS 07556	Machine Learning I				3
DS 02510	Visual Analytics				3
ECE 09555	Advanced Topics in Pattern Recognition				3
ENGR 01511	Engineering Optimization				3
MATH 01505	Probability and Mathematical Statistics I				3
MATH 03511	Operations Research I				3
STAT 02509	Probability and Statistics for Data Science				3
				Subtotal: 9 s.h.	

Elective Courses / Thesis – 15 s.h.

Thesis students must take 6 to 9 semester hours of Thesis Research.
Students can also use core courses as electives if not counting for the Core Course Section above.

Course #	Course Name	Notes	Sem/Yr	Grade	Credits
BINF 05555	Bioinformatics - Advanced Biological Applications				3
CS 01541	Bioinformatics – Advanced Computational Aspects				3
CS 02530	Advanced Database Systems: Theory and Programming				3
CS 02570	Information Visualization				3
CS 02605	Data Mining II				3
CS 02625	Data Quality and Web/Text Mining				3
CS 02630	Advanced Topics in Database Systems				3
CS 07540	Advanced Design and Analysis of Algorithms				3
DA 01505	Data Analytics Capstone Practicum				3
DA 03510	Patient Data Understanding				3
DA 03511	Patient Data Privacy & Ethics				3
DA 03520	Healthcare Management				3
ECE 09558	Reinforcement Learning				3

ECE 09560	Artificial Neural Networks				3
ECE 09566	Advanced Topics in Systems, Devices, and Algorithms in Bioinformatics				3
ECE 09568	Discrete Event Systems				3
ECE 09585	Advanced Engineering Cyber Security				3
ECE 09586	Advanced Portable Platform Development				3
ECE 09595	Advanced Emerging Topics in Computational Intelligence, Machine Learning and Data Mining				3
ECE 09655	Advanced Computational Intelligence and Machine Learning				3
MATH 01506	Probability and Mathematical Statistics II				3
MGT 07500	Managerial Decision Making Tools				3
MGT 07600	Predictive Analysis				3
STAT 02510	Introduction to Statistical Data Analysis				3
STAT 02511	Statistical Computing				3
STAT 02514	Decision Analysis				3
STAT 02525	Design and Analysis of Experiments				3
STAT 02530	Applied Survival Analysis				3
STAT 02585	Introduction to Bayesian Statistical Methods				3

Thesis students should take Thesis I, Thesis II, and optionally Thesis III

DS 03650	Thesis I in Data Science				3
DS 03651	Thesis II in Data Science				3
DS 03652	Thesis III in Data Science				3
					Subtotal: 15 s.h.

Minimum Required Grades and Cumulative GPA

The Master of Science in Data Science is a Category 3 program.

For details regarding satisfactory academic progress and graduation requirements, please visit www.rowanu.com/policies.