

DATA SCIENCE, CERTIFICATE IN (POST-BACCALAUREATE GRADUATE CERTIFICATE)

The Certificate in Data Science will train students in computer methods for analyzing big datasets generated by industry, research and government entities. Students will learn techniques for transforming the data into knowledge; developing algorithms for constructing computer systems that automatically learn from data; and tracking and evaluating new techniques and approaches in data science. The program will prepare graduates for entry into jobs as specialists in data science for industry and the public sector.

Student learning outcomes

1. **Data science foundations:** Graduates will demonstrate a solid understanding of the foundational concepts underlying data science.
2. **Data science specialization:** Graduates will demonstrate the ability, knowledge and technical skills to process and analyze data in order to extract new insights.

VCU Graduate Bulletin, VCU Graduate School and general academic policies and regulations for all graduate students in all graduate programs

The VCU Graduate Bulletin website documents the official admission and academic rules and regulations that govern graduate education for all graduate programs at the university. These policies are established by the graduate faculty of the university through their elected representatives to the University Graduate Council.

It is the responsibility of all graduate students, both on- and off-campus, to be familiar with the VCU Graduate Bulletin as well as the **Graduate School website** and academic regulations in individual school and department publications and on program websites. However, in all cases, the official policies and procedures of the University Graduate Council, as published on the VCU Graduate Bulletin and Graduate School websites, take precedence over individual program policies and guidelines.

Visit the [academic regulations section for additional information on academic regulations for graduate students](#).

Degree candidacy requirements

A graduate student admitted to a program or concentration requiring a final research project, work of art, thesis or dissertation, must qualify for continuing master's or doctoral status according to the degree candidacy requirements of the student's graduate program. Admission to degree candidacy, if applicable, is a formal statement by the graduate student's faculty regarding the student's academic achievements and the student's readiness to proceed to the final research phase of the degree program.

Graduate students and program directors should refer to the following degree candidacy policy as published in the VCU Graduate Bulletin for complete information and instructions.

Visit the [academic regulations section for additional information on degree candidacy requirements](#).

Graduation requirements

As graduate students approach the end of their academic programs and the final semester of matriculation, they must make formal application to graduate. No degrees will be conferred until the application to graduate has been finalized.

Graduate students and program directors should refer to the following graduation requirements as published in the Graduate Bulletin for a complete list of instructions and a graduation checklist.

Visit the [academic regulations section for additional information on graduation requirements](#).

Apply online at graduate.admissions.vcu.edu (<http://www.graduate.admissions.vcu.edu/>).

Admission requirements

Degree:	Semester(s) of entry:	Deadline dates:	Test requirements:
Certificate	Fall (preferred)	Jun 1	TOEFL required for all international students
	Spring	Nov 1	

Admission criteria

The admission requirements outlined below apply to all students. All applicants to post-baccalaureate certificate programs are required to submit the online application form to VCU Undergraduate Admissions.

The Department of Computer Science also requires the following additional materials:

- Official undergraduate transcripts from all schools attended
- A resume stating relevant work experience
- A statement of purpose outlining career goals
- Three letters of recommendation – professional and/or academic

To be considered for admission to the certificate program, all candidates must satisfy the following requirements:

- Applicants must already have a bachelor's degree. A bachelor's degree in computer science or in a closely related discipline is highly preferred.
- Applicants will be considered on a case-by-case basis, however, candidates should present an undergraduate minimum GPA of 3.0 and have completed at least one semester of calculus and one semester of discrete mathematics (VCU MATH 211 or equivalent), both with minimum grades of B.

Non-native English speakers will provide evidence of proficiency in English by one of the following methods:

- A Test of English as a Foreign Language minimum composite score of 100 for the Internet-based test or score of 600 for the paper-based test
- or
- An International English Language Testing System minimum score of 6.5 on the academic exam

Acceptance of an applicant is based upon the recommendation of the computer science graduate committee with approval of its director and the associate dean for graduate studies.

Students may transfer up to three credits from outside of the program to fulfill the program requirements. The transfer must be approved by the computer science graduate committee.

(804) 828-9671

Program website: computer-science.egr.vcu.edu/graduate (<http://computer-science.egr.vcu.edu/graduate/>)

Degree requirements

The focus of the curriculum is centered on the two required courses, CMSC 435 and CMSC 635, which together provide the foundation for more advanced graduate-level elective courses. The main strength of the curriculum is the combination of deep knowledge in machine learning methods and tools provided by the required courses, with the breadth of data-oriented training opportunities provided by the electives, allowing the students to tailor their plan of study toward their professional interests.

Course	Title	Hours
Required courses		
CMSC 435	Introduction to Data Science	3
CMSC 635	Knowledge Discovery and Data Mining	3
Restricted elective (choose one)		
CMSC 516	Advanced Natural Language Processing	3
CMSC 603	High Performance Distributed Systems	
CMSC 630	Image Analysis	
Open elective (choose one)		
CMSC 510	Regularization Methods for Machine Learning	3
CMSC 516	Advanced Natural Language Processing ¹	
CMSC 601	Convex Optimization	
CMSC 603	High Performance Distributed Systems ¹	
CMSC 630	Image Analysis ¹	
CMSC 636	Artificial Neural Networks and Deep Learning	
CMSC 678	Statistical Learning and Fuzzy Logic Algorithms	
Total Hours		12

¹

Course may be used as an open elective if not taken as a restricted elective.

The minimum total of credit hours required for this certificate is 12.

Graduate program director

Tom Arodz, Ph.D.
Associate professor
csgad@vcu.edu
(804) 827-3989

Additional contact

Krzysztof J. Cios, Ph.D.
Professor and chair, Department of Computer Science
kcios@vcu.edu