CYBERSECURITY, CERTIFICATE IN (POST-BACCALAUREATE CERTIFICATE)

The Certificate in Cybersecurity will train students to analyze and respond to threats against the security of computer systems. Students who complete the certificate will be able to assist software developers and system administrators by analyzing the security of databases, applications, networks and computer systems; assessing security risks and identifying vulnerabilities in computer and network systems; and developing methods and techniques for defending against a range of types of cyber attacks. The program will prepare graduates for entry into jobs as specialists in cyber defense for industry and the public sector.

Student learning outcomes

1. **Cybersecurity foundations:** Graduates will demonstrate a solid understanding of the foundational concepts underlying cybersecurity.
2. **Cybersecurity specialization:** Graduates will demonstrate the ability, knowledge and technical skills to assess and mitigate specific types of cybersecurity risk.

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 (http://www.graduate.vcu.edu/) 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. (http://bulletin.vcu.edu/academic-regs/)

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. (http://bulletin.vcu.edu/academic-regs/grad/graduation-info/)

Apply online today. (https://www.vcu.edu/admissions/apply/graduate/)

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 must 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 fulfil the program requirements. The transfer must be approved by the computer science graduate committee.

Degree requirements

All students must take four courses in total, including one course from the list of three restricted undergraduate electives, one course from the

list of three restricted graduate electives and two other courses from the list of open electives.

Curriculum requirements

Course	Title	Hours
Restricted undergraduate elective (choose one)		**3**
CMSC 413	Introduction to Cybersecurity	
CMSC 414	Computer and Network Security	
CMSC 415	Introduction to Cryptography	
Restricted graduate elective (choose one)		**3**
CMSC 615	Cryptocurrency and Blockchain Techniques	
CMSC 618	Database and Application Security	
CMSC 622	Network and System Security	
Open electives (choose two)		**6**
CMSC 512	Advanced Social Network Analysis and Security	
CMSC 525	Introduction to Software Analysis, Testing and Verification	
CMSC 612	Game Theory and Security	
CMSC 615	Cryptocurrency and Blockchain Techniques [1]	
CMSC 618	Database and Application Security [1]	
CMSC 620	Applied Cryptography	
CMSC 622	Network and System Security [1]	
CMSC 628	Mobile Networks: Applications, Modeling and Analysis	
Total Hours		**12**

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

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

Contact
Bridget Thomson-McInnes, Ph.D.
Associate professor and graduate program director
csgrad@vcu.edu

Additional contact
Krzysztof J. Cios, Ph.D.
Professor and chair, Department of Computer Science
kcios@vcu.edu
(804) 828-9671

Program website: computer-science.egr.vcu.edu/graduate (https://egr.vcu.edu/departments/computer/academics/graduate/)