Doctor of Engineering in Cybersecurity Analytics (Online, DC3)

Introduction
The School of Engineering and Applied Science Online Programs offers the Doctor of Engineering (D.Eng.) degree in Cybersecurity Analytics. Classes are held on Saturday starting in Fall 2022 with a target graduation date of Summer 2024. Applicants should normally hold a master’s degree in engineering, applied science, mathematics, computer science, information technology, or related field from an accredited institution.

The Doctor of Engineering in Cybersecurity Analytics
The D.Eng. in Cybersecurity Analytics addresses the widespread need for practitioners who can apply advanced knowledge from the program of study to address real-world cybersecurity challenges, whereas a Ph.D. in cybersecurity contributes to fundamental research. The D.Eng. in Cybersecurity Analytics empowers the student to plan and implement security measures to protect an organization’s network and systems, implement strategies to track threats and monitor networks for security breaches, build secure and resilient computer systems with subject matter expertise in cybersecurity analytics, advanced tools and techniques for ensuring confidentiality, integrity, and availability of an organization’s data and systems.

Curriculum
The curriculum comprises 45 credit hours of graduate level courses and a research phase during which the student writes and defends a praxis paper. The research phase requires a minimum of 15 credit hours.

Proposed Courses
- CSCI 6015 Cyber Forensics (3 credits)
- CSCI 6016 Applied Network Defense (3 credits)
- SEAS 6800 Python Applications in Cyber Analytics
- ECE 6160 Secure Computer Architecture (3 credits)
- SEAS 8410 Security Data Analysis & Visualization (3 credits)
- SEAS 8414 Analytical Tools for Cyber Analytics (3 credits)
- SEAS 8415 Applied Cryptography and Data Protection (3 credits)
- SEAS 8499 Praxis Development for Cybersecurity (3 credits)
- SEAS 8998 Advanced Reading and Research, Part 1 (3 credits)
- SEAS 8998 Advanced Reading and Research, Part 2 (3 credits)
- SEAS 8199 Praxis Research for Doctor of Engineering (15 credits)

Course work culminates in the praxis proposal, a research report that proposes a practice-based solution – to a problem in cybersecurity of the student’s own choosing – that could be used by cybersecurity practitioners.

Classroom Phase Schedule
Course sessions last 10 weeks. Classes meet Saturday mornings from 9:00 am-12:00 pm and afternoons from 1:00-4:00 pm (all times Eastern). This program is taught in an accelerated, cohort format in which students take all courses in lock step. Classes cannot be taken out of sequence, attendance at all class meetings is expected, and students must remain continuously enrolled; i.e., leaves of absence are permitted only in medical or family emergency, or in case of deployment to active military duty.

<table>
<thead>
<tr>
<th>Session</th>
<th>#Courses</th>
<th>#Credit Hours</th>
<th>Tentative Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall-1 2022</td>
<td>2</td>
<td>6</td>
<td>August 13 – Oct 15, 2022</td>
</tr>
<tr>
<td>Fall-2 2022</td>
<td>2</td>
<td>6</td>
<td>October 22 – Jan 14, 2023</td>
</tr>
<tr>
<td>Spring-1 2023</td>
<td>2</td>
<td>6</td>
<td>January 21 – March 25, 2023</td>
</tr>
<tr>
<td>Spring-2 2023</td>
<td>2</td>
<td>6</td>
<td>April 1 – June 10, 2023</td>
</tr>
<tr>
<td>Summer 2023</td>
<td>2</td>
<td>6</td>
<td>June 17 – August 19, 2023</td>
</tr>
</tbody>
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*No classes on Memorial Day, Thanksgiving, Christmas, and New Year Weekends*
**Research Phase (Min. 15 Credit Hours)**

In order to be successfully awarded the D.Eng. degree, students must earn a grade point average of at least 3.2 in the 10 classroom courses, and no grade below B-. Upon completion of the classroom phase, students are registered for a minimum of 15 credit hours (ch) of SEAS 8199 Praxis Research: 6 ch in Fall 2023, 6 ch in Spring 2024, and 3 ch in Summer 2024. Throughout the research phase, the student develops the praxis on an advisor-approved topic related to cybersecurity. Faculty research director(s) meet with students at least once per month, who are expected to attend each meeting.

**Research Areas for Praxis**

With the advisor’s consent, the student may elect to focus on an area within the Cybersecurity field. Below, find sample areas of research:

- Addressing the Cybersecurity Malicious Insider threat
- Exploring Cybersecurity Requirements in the Defense Acquisition Process
- Internet of Things Device Cybersecurity
- Cybersecurity of Networked Home Medical Devices
- Cybersecurity Challenges in Healthcare Industries

**Cost**

All classes meet live online through synchronous distance learning technologies. Classes are recorded for future viewing. Tuition is billed at $1625 per credit hour for the 2022-2023 year. A non-refundable tuition deposit of $495, which is applied to tuition in the first semester, is required when the student accepts admission.

**Course Descriptions**

See also [http://bulletin.gwu.edu/courses](http://bulletin.gwu.edu/courses)

CSCI 6015 Cyber Forensics. Acquiring, preserving and analyzing digitally stored information while ensuring that this information is admissible as evidence in a court of law. Principles and techniques for cyber forensics investigations using industry-standard forensic process.

CSCI 6016 Applied Network Defense. Computer security: protection aspects of the Internet. Cryptographic tools to provide security, such as shared key encryption (DES, 3DES, RC and more), public key encryption, key exchange, and digital signature. Internet protocols and applications.

ECE 6160 Secure Computer Architecture. Building blocks of secure hardware and systems: trusted execution environment, security engines; side and covert channels in computing systems; hardware trojans; physically unclonable functions and challenges; obfuscation strategies.

SEAS 6410. Security Data Visualization. Visualization aspect of security data, including study of data analytics and scaling up information security, security metrics and security monitoring techniques focusing on industry applications. Tools for security data visualization and analytics.

SEAS 6800 Python Applications in Cyber Analytics Introduction to programming with Python; Developing python scripts to automate data cleaning; Introduction to machine learning with Python including text mining and time series analysis; Performing cyber security tasks such as anomaly detection, DoS attack detection, and spam detection using Python.

SEAS 8414 Analytical Tools for Cyber Analytics. This course is designed to provide students with the basic foundations for application of deterministic, probabilistic, and statistical models to address problems in cyber analytics.

SEAS 8415 Applied Cryptography and Data Protection: Introduction to cryptographic techniques, case studies for real-life applications of modern cryptographic solutions, classical cryptographical algorithms (AES, RSA, RC4) and techniques (symmetric, asymmetric-public key cryptography, hash functions), digital signatures, key management and distribution. Advanced topics such as zero-knowledge proofs and zero-trust architectures.

SEAS 8499 Praxis Development for Cybersecurity. Overview of research methods. Aims and purpose of the praxis. Development of praxis research strategies, formulation and defense of a praxis proposal. Praxis proposal defense must be passed before the student is admitted to degree candidacy to undertake praxis work. Restricted to students who have completed all required coursework for the D.Eng. in the field of Cybersecurity Analytics.

SEAS 8998 Advanced Reading and Research. Identification and development of potential praxis research topics in cybersecurity.

SEAS 8199 Praxis Research for Doctor of Engineering. Independent applied research in cybersecurity culminating in the final praxis report and final examination for the degree of Doctor of Engineering. May be repeated for credit. Restricted to students in the D.Eng. in the field of Cybersecurity Analytics.

*The University reserves the right to adjust course offerings, schedules, and tuition rates.*