

**Syllabus for
SEAS 8405-DC8
Cybersecurity Architecture
Spring-2 2025**

Instructor: Ravi Mallarapu
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Credit Hours: 3 credit hours
Course Website: On Blackboard
Class Time and Dates:

- Day and Time: **Saturday 9:00 to 12:10 pm (Eastern)**
- All Class Meeting Dates: **March 22, 29; Apr 5, 12, 19, 26; May 3, 10, 17, 31.**
- Attendance is expected at all sessions. If an absence from a class meeting is needed (due to family/medical or work-related emergency), students must contact the instructor in advance.
- Online classes are conducted via Zoom; Links are provided in Blackboard.
- Zoom link for Office Hours: **<https://gwu-edu.zoom.us/my/mallarapu>**

Office Hours: For 3 hours every week, I will be available for drop-in office hours, as follows:

- **Every Thursday 3pm - 6pm ET**

Bulletin Description of the Course:

Despite implementing defense-in-depth security, MITRE frameworks, DevSecOps practices, and cloud-native security systems, major corporations still face security incidents and data breaches caused by zero-day exploits and advanced persistent threats. To tackle these challenges, we need to shift our focus toward architecture-centric security, emphasizing strong system design as the foundation for prevention, detection, and recovery. This course analyzes nine real-world cybersecurity incidents and data breaches, aiming to understand past failures and develop design principles, research insights, and new solutions with modern tools to enhance the field of cybersecurity architecture.

Course Learning Objectives:

Upon completing the course, students will know how to:

1. **Analyze:** Critically examine real-world breaches (nine case studies) to identify architectural vulnerabilities exploited by zero-day and APTs.
2. **Design:** Build resilient architectures for diverse environments (network, data, cloud, web application, Web 3.0, IAM, application, blockchain) addressing these vulnerabilities.
3. **Build:** Integrate security principles (Zero Trust, defense-in-depth, DevSecOps, cloud-native) and frameworks (NIST CSF, MITRE ATT&CK, SABSA) to create holistic architectures against zero-day and APTs.
4. **Communicate:** Effectively communicate architectural designs, vulnerabilities, and solutions to technical and non-technical audiences.

Required Textbook and Other Materials:

- Textbook: None.
The textbook is available at None.
- Other Material: Reading material per class and lecture notes will be available on Blackboard.

Average Amount of Out-of-Class or Independent Learning Expected per Week:

Over 10 weeks, there will be 10 sessions of 3 hours and 10 min each, and 2 sessions of 3 hours each, which are devoted to exams, for a total of 37.5 hours direct instruction. Homework and out-of-class reading is estimated to be 7.5 hours per week. This is a total of 112.5 hours.

Class Schedule and Assignments

Class	Topic/Activity	Assignment Due
1	Foundations of Cybersecurity Architecture	None
2	Network Security Architecture Case Study: Target Data Breach	HW1 Due: Mar 28th, Midnight ET
3	Data Security Architecture Case Study: Equifax Data Breach	HW2 Due: Apr 4th, Midnight ET
4	Supply Chain Architecture Case Study: SolarWinds Backdoor	HW3 Due: Apr 11th, Midnight ET
5	Cloud Security Architecture Case Study: Capital One Data Breach	HW4 Due: Apr 18th, Midnight ET
6	Web Application Security Case Study: British Airways Breach	HW5 Due: Apr 25th, Midnight ET MIDTERM EXAM Open: Apr 26, Midnight ET Close: Apr 27, Midnight ET
7	Web 3.0 Security Architecture Case Study: The DAO Hack	HW6 Due: May 2nd, Midnight ET
8	IAM Architecture Case Study: Okta Breach	HW7 Due: May 9th, Midnight ET
9	Application Security Architecture Case Study: Log4Shell	HW8 Due: May 16th, Midnight ET
10	Blockchain Security Architecture Case Study: Ronin Network Hack	HW9 Due: May 30th, Midnight ET FINAL EXAM Open: May 31st, Midnight ET Close: Jun 2nd, Midnight ET

Course recordings: Downloadable recordings of each class session will be available within about 2 hours of the conclusion of class meetings and will be available for the duration of the course. These recordings are to be used exclusively by registered students in that class for their own private use. *Releasing these recordings is strictly prohibited.*

Exams:

- There will be a mid-term and a final exam, both closed book, administered on Blackboard outside the class meeting time.
- You may only use calculators native to the PC or Mac as well as Excel.
- Each exam is designed to be completed in 2.5 hours, with a 3-hour window to take it in.
- You are permitted to bring a single, 8.5"x11", reference sheet (front and back) to each exam, any format.
- **The mid-term will be released on Saturday, Apr. 26, at midnight (11:59 pm Eastern time) and must be started no later than the following Sunday, midnight (11:59 pm Eastern time). The final exam will be released on Saturday, May 31, at midnight (11:59 pm Eastern time) and must be started no later than the following Monday, midnight (11:59 pm Eastern time).**
 - Students are highly encouraged to take the exam early during the exam period
 - Exams are proctored by Honorlock, which records the examinee's webcam, audio, and desktop. Certified reviewers confirm that the student adheres to the institution's and the faculty member's policies. Information about Honorlock can be found at the following link: <https://online.engineering.gwu.edu/student-resources/>
 - Contact Mark Griffith at seasonline@gwu.edu (202-422-2806) and copy instructor email regarding issues related to the exam in Honorlock and/or Blackboard

Online Engineering Programs Labs: Students can remotely access most computer labs of the School of Engineering and Applied Science and work with a variety of engineering design and analysis software packages. See <https://www.seas.gwu.edu/remote-access-labs>

Grading:

GW's grading system for graduate students is: **A**, Excellent; **B**, Good; **C**, Satisfactory; **F**, Fail; other grades that may be assigned are **A-**, **B+**, **B-**, **C+**, **C-**. In this course, grades are determined by weighted average values and based on a standard curve relative to the class average:

Homework, totaling:	30%
Exam 1	35%
Exam 2	35%

Written work must comply with the Academic Integrity Policy of the George Washington University policy. Any plagiarized material will receive a grade of 0. No late submission of homework or discussion board will be accepted.

Withdrawals:

- Students may drop from courses through the day after the second class meeting without any academic or financial penalty. After that time, students may withdraw through the day after the eighth class meeting and will receive a designation of "W" and are responsible for full tuition.

Incomplete

- Students who cannot complete a course due to deployment overseas/called to active military duty/death in the immediate family/debilitating illness may seek an incomplete with proper documentation.

University Policies

University Policy on Observance of Religious Holidays: Students should notify faculty during the first week of the semester of their intention to be absent from class on their day(s) of religious observance. See <https://registrar.gwu.edu/university-policies#holidays>

Student Disability Support Services (DSS) 202-994-8250: Students needing an accommodation based on the potential impact of a disability should contact Disability Support Services. See <https://disabilitysupport.gwu.edu/>.

Student Mental Health Services 202-994-5300: GW offers 24/7 assistance and referral for students needing crisis

and emergency mental consultations, confidential assessment, and counseling services. See <https://counselingcenter.gwu.edu/>.

Online Engineering Programs Office Policies: <https://online.engineering.gwu.edu/policies-procedures-doctoral>

Emergencies: In case of emergency, students will be notified on Blackboard.

Academic Integrity Code: Academic dishonesty is defined as cheating of any kind, including misrepresenting one's own work, taking credit for the work of others without crediting them and without appropriate authorization, and fabricating information. All academic work is subject to GW University and SEAS Online Programs policy and may be scrutinized electronically. For more information, see <https://studentconduct.gwu.edu/>.

Student Guidelines for “Honorlock”, our exam proctoring software

Honorlock is used with all online exams:

- Students must establish identity following the procedures outlined in the [Honorlock User Guide](#).
- Students are responsible for testing the functionality of the system well in advance of the remote-proctored exams in their courses so that any troubleshooting required can be accomplished. Check with your exam sponsor/faculty member for practice exams.

Review the Honorlock video tutorial streaming recording link at:

<https://honorlock.kb.help/how-to-use-honorlock-student/>

Test Environment Requirements

The online test environment should mimic the in-class test environment, and conform to the following:

Test Area

- Sit at a clean desk or table (not on a bed or couch).
- Ensure that lighting in the room is bright enough to be considered "daylight" quality. Overhead lighting is preferred; however, if overhead is not possible, the source of light should not be behind you.
- Clear the desk or table of all materials: Students can have a single sheet of 8.5 x 11 inch paper with handwritten or typed notes on the front and back only
- Use one computer monitor only; dual monitors are not permitted.
- Have no writing on desk or walls or any notes or writing saved as your computer desktop background.
- No software other than Honorlock and Blackboard should be open unless permitted by the instructor.
- Close all other programs and/or windows on the testing computer before logging in to the proctored test environment.
- Do not have a radio or television playing in the background.
- Do not talk to anyone else—you may not communicate with others by any means.
- No other persons except the test-taker is permitted in the room during testing.
- If a calculator is required, you may use the calculator that comes with the Mac or the Windows operating system only. No physical calculators will be allowed in the testing area.

Behavior

- Dress as if in a public setting
- You will be allowed to take a brief bathroom break during the exam. You should not leave the room for any other reason during the exam. Do not take the computer into another room to finish testing (exam must be completed in the same room as the “Exam Environment View”).
- No headsets, ear plugs, or similar audio devices are permitted
- Cell phones are not permitted in the exam room.

- Your entire face must be visible throughout the exam. Being out of camera view is considered an exam violation. You should check the thumbnail at the top of the screen to confirm.
- Your ID photo ID must be readable

Test Area Policy Violations

These are the consequences of violating test area policies that do not involve cheating. **Allegations of cheating will be adjudicated under the code of academic integrity, with a minimum recommended sanction of a grade of Zero on the exam.**

- Minor Violations – radio/TV in the background, someone enters the room, sitting on a couch, any part of face out of camera view briefly (less than 5 minutes in total), second monitor (off) on the desk, improper lighting, using headphones, wearing hats, sunglasses, etc.
 - If you are flagged for a minor violation, you will receive a warning for the first offense. Students who commit minor violations after being warned will be penalized 10% on the exam, and 20% on subsequent occurrences. Minor violations will be counted cumulatively across the entire program.
- Major Violations - using the phone or other devices, using additional screens, any part of face out of camera view (more than 5 min), communicating with another individual by any means.
 - If you are flagged for a major violation, you will be penalized 20% on the exam, and 40% on subsequent occurrences. In the case of major violations, the student may be referred to the office of academic integrity.

Homework and other written material

Written work must comply with the Academic Integrity Policy of the George Washington University policy. Any plagiarized material will receive a grade of 0 and the student may be referred to the office of academic integrity.