COLLEGE OF ENGINEERING, UIC
CS, 487, Building Secure Computer Systems, 3 (UG)/4 (G)

I. Instructor & Course Details

Xiaoguang Wang
Email address: xgwang9@uic.edu
Drop-In Office Hours (in-person): Tuesday 3:30 PM - 4:30 PM or by appointment
Drop-In Hours location: SEO 1331

Blackboard Course Site **(should be automatically linked to your Blackboard account)**
Students are expected to log into the course site regularly to learn about any developments related to the course, upload assignments, and communicate with classmates. For all technical questions about Blackboard, email the Learning Technology Solutions team at LTS@uic.edu.

Course Modality and Schedule

This course is taught **ON CAMPUS**.

- DAYS and TIMES: Monday and Wednesday, 3:00 PM to 4:15 PM
- LOCATION: SES 138

II. Course Information

Catalog Course Description and Prerequisite/corequisite Statement

This course aims to provide students with a good understanding of the theories, principles, techniques, and practices for building secure computer systems. Students will gain the knowledge and skills necessary to design, implement, and maintain secure computer systems in a rapidly evolving digital landscape through theoretical concepts, practical exercises, and real-world case studies. This class covers both offensive techniques and defensive solutions. Students will study software and system security (binary reverse engineering, vulnerability analysis, exploit and shellcode development), cryptographic background and tools, access control and authentication, intrusion detection and prevention systems (firewalls), etc., to understand how attackers hack the system and how to protect computer software. A crucial part of studying security is putting skills to the test in practice. In this class, students' progress is evaluated by quizzes, assignments (e.g., hacking challenges), and a project.

Course Goals and Learning Outcomes

By the end of the course, students should be able to:

- Understand fundamental principles of computer security and threat models.
- Identify common vulnerabilities and apply appropriate mitigation techniques.
- Understand software security analysis and use reverse engineering tools.
- Evaluate and select encryption and authentication mechanisms.
- Analyze and assess security risks in complex computer systems.
- Apply best practices for secure system administration and network configuration.
- Be familiar with computer security research.

Required and Recommended Course Materials

William Stallings and Lawrie Brown, Computer Security: Principles and Practice, 4th edition, Pearson, 2017.

Optional:
Wenliang Du, Computer Security: A Hands-on Approach, 2nd Edition, 2017.

Required Technology

- Basic knowledge of computer architecture and operating systems (e.g., Linux).
- Familiarity with programming languages (e.g., C/C++, Python).

Respect for Copyright

Please protect the copyright integrity of all course materials and content. Please do not upload course materials not created by you onto third-party websites or share content with anyone not enrolled in our course.

III. COURSE POLICIES & CLASSROOM EXPECTATIONS

Grading Policy and Point Breakdown

- Quizzes and assignments: [35%]
- Midterm examination: [15%]
- Final project: [40%]
- Class participation and discussions: [10%]

The letter grade will be assigned as: A :≥ 90, A− : [85, 90), B+ : [80, 85), B : [75, 80), C : [65, 75), D : [55, 65), E : [50, 55), F :< 50.

Policy for Missed or Late Work

- Late submission (0, 24 hours] will be accepted with a 15% penalty;

- Late submission (24-48 hours] will be accepted with a 30% penalty;
- Late submission beyond 48 hours will not be accepted.

Attendance / Participation Policy

Policy:
Please email me if you face an unexpected situation that may impede your attendance, participation in required class and exam sessions, or timely completion of assignments.

Other Course Policies

Academic Integrity

As a student and member of the UIC community, you are expected to adhere to the Community Standards of academic integrity, accountability, and respect. Please review the UIC Student Disciplinary Policy for additional information.

Email Expectations

Students are responsible for all information instructors send to your UIC email and Blackboard accounts. Faculty messages should be regularly monitored and read in a timely fashion.

IV. COURSE SCHEDULE

Weekly Schedule of Class Topics

Week 1: Logistics & Introduction to Computer Security
Week 2: Memory Safety
Week 3: Control Flow Hijacking and Shellcode
Week 4: Format String
Week 5: Code Reuse Attacks, Return-Oriented Programming
Week 6: Heap Overflow, Integer Overflow, Race Conditions
Week 7: Malware Defense, Vulnerability Discovery, Fuzzing
Week 8: Passwords and Authentication
Week 9: Access Control
Week 10: Message Integrity and Confidentiality
Week 11: Public Key Cryptography
Week 12: Network Security, Firewall, SSH, SSL, and IPsec
Week 13: Hardware Side-channel Attacks
Week 14: Recent Topics in Computer Security
Week 15: Final Project

Disclaimer

This syllabus is intended to give the student guidance on what may be covered during the semester and will be followed as closely as possible. However, as the instructor, I reserve the

right to modify, supplement, and make changes as course needs arise. I will communicate such changes in advance through in-class announcements and in writing via Blackboard Announcements.

V. ACCOMMODATIONS

Disability Accommodation Procedures

UIC is committed to full inclusion and participation of people with disabilities in all aspects of university life. If you face or anticipate disability-related barriers while at UIC, please connect with the Disability Resource Center (DRC) at drc.uic.edu, via email at drc@uic.edu, or call (312) 413-2183 to create a plan for reasonable accommodations. To receive accommodations, you will need to disclose the disability to the DRC, complete an interactive registration process with the DRC, and provide me with a Letter of Accommodation (LOA). Upon receipt of an LOA, I will gladly work with you and the DRC to implement approved accommodations.

Religious Accommodations

Following campus policy, if you wish to observe religious holidays, you must notify me by the tenth day of the semester. If the religious holiday is observed on or before the tenth day of the semester, you must notify me at least five days before you will be absent. Please submit this form by email with the subject heading: **"YOUR NAME: Requesting Religious Accommodation."**

VI. CLASSROOM ENVIRONMENT

Inclusive Community

UIC values diversity and inclusion. Regardless of age, disability, ethnicity, race, gender, gender identity, sexual orientation, socioeconomic status, geographic background, religion, political ideology, language, or culture, we expect all members of this class to contribute to a respectful, welcoming, and inclusive environment for every other member of our class. If aspects of this course result in barriers to your inclusion, engagement, accurate assessment, or achievement, please notify me as soon as possible.

Name and Pronoun Use

If your name does not match the name on my class roster, please let me know as soon as possible. My pronouns are *[she/her; he/him; they/them]*. I welcome your pronouns if you would like to share them with me. For more information about pronouns, see this page: https://www.mypronouns.org/what-and-why.

Community Agreement/Classroom Conduct Policy

- Be present by turning off cell phones and removing yourself from other distractions.
- Be respectful of the learning space and community. For example, no side conversations or unnecessary disruptions.
- Use preferred names and gender pronouns.

- Assume goodwill in all interactions, even in disagreement.
- Facilitate dialogue and value the free and safe exchange of ideas.
- Try not to make assumptions, have an open mind, seek to understand, and not judge.
- Approach discussion, challenges, and different perspectives as an opportunity to "think out loud," learn something new, and understand the concepts or experiences that guide other people's thinking.
- Debate the concepts, not the person.
- Be gracious and open to change when your ideas, arguments, or positions do not work or are proven wrong.
- Be willing to work together and share helpful study strategies.
- Be mindful of one another's privacy, and do not invite outsiders into our classroom.

Content Notices and Trigger Warnings

Our classroom provides an open space for a critical and civil exchange of ideas, inclusive of a variety of perspectives and positions. Some readings and other content may expose you to ideas, subjects, or views that may challenge you, cause you discomfort, or recall past negative experiences or traumas. I intend to discuss all subjects with dignity and humanity, as well as with rigor and respect for scholarly inquiry. If you would like me to be aware of a specific topic of concern, please email or visit my Student Drop-In Hours.

VII. RESOURCES: Academic Success, Wellness, and Safety

We all need the help and the support of our UIC community. Please visit my **drop-in hours** for course consultation and other academic or research topics. For additional assistance, please contact your assigned college advisor and visit the support services available to all UIC students.

Academic Success

- UIC Tutoring Resources
- College of Engineering tutoring program
- Equity and Inclusion in Engineering Program
- UIC Library and UIC Library Research Guides.
- Offices supporting the UIC Undergraduate Experience and Academic Programs.
- Student Guide for Information Technology
- First-at-LAS Academic Success Program, focusing on LAS first-generation students.

Wellness

- **Counseling Services**: You may seek free and confidential services from the Counseling Center at https://counseling.uic.edu/.
- Access U&I Care Program for assistance with personal hardships.
- **Campus Advocacy Network**: Under Title IX, you have the right to an education that is free from any form of gender-based violence or discrimination. To make a report, email

TitleIX@uic.edu. For more information or confidential victim services and advocacy, visit UIC's Campus Advocacy Network at http://can.uic.edu/.

Safety

- UIC Safe App—PLEASE DOWNLOAD FOR YOUR SAFETY!
- UIC Safety Tips and Resources
- Night Ride
- Emergency Communications: By dialing 5-5555 from a campus phone, you can summon the Police or Fire for any on-campus emergency. You may also set up the complete number, (312) 355-5555, on speed dial on your cell phone.