

**The University of Texas at El Paso**  
**Department of Computer Science**  
**Syllabus**  
**CS 4351/5352: Computer Security**  
**Spring 2024**

**Name of course:** Computer Security

**CRN:** 25027/21126

**Term:** Spring 2024

**Delivery Method:** In-person

**Time and Location:**

- MW: 4:30 pm-5:50pm
- EDUC 112

**Instructor:** Palvi Aggarwal

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**Phone:** (915) 747-6399

**Office:** CCSB 3.1014

**Office Hours:** MW 3:00-4:20pm or by appointment

**Office Hours Location:** CCSB 3.1014

### **A. Course Description:**

The primary goal of this course is to provide fundamental concepts and applied methods of computer security that addresses various confidentiality, integrity, and availability related challenges associated to data, system, and network assets. Topics include system security analysis, access control and various security models, identification and authentication, protection against external and internal threats, network protocols and Internet security.

### **B. Course Objectives**

This course introduces a variety of topics in applied computer, network, and system security. These include system/software vulnerabilities, applied cryptography, host-based and network-based security, privacy, anonymity, usability, security economics, risks and vulnerabilities, policy formation, controls and protection methods, and issues of law and privacy.

### **C. Course Outcomes**

#### **Knowledge and Comprehension**

1. Describe the functioning of various types of malicious codes.
2. Enumerate programming techniques that enhance security.
3. Explain the various controls available for protection against Internet attacks, including authentication, integrity check, firewalls, and intruder detection systems.
4. Describe different ways of providing authentication of a user or program.
5. Describe the mechanisms used to provide security in programs, operating systems, databases and networks.
6. Describe the background, history and properties of widely used encryption algorithms.
7. Describe legal, privacy and ethical issues in computer security.
8. List and explain the typical set of tasks required of an information security professional.

## **Application and Analysis**

1. Compare different access control, file protection or authentication mechanisms.
2. Set up file protections in a UNIX or Windows file system to achieve a given purpose.
3. Incorporate encryption, integrity check and/or authentication into a given program or algorithm.

## **Synthesis and Evaluation**

1. Appraise a given code fragment for vulnerabilities.
2. Appraise a given protocol for security flaws.
3. Assess risk for a given network system using publicly available tools and techniques

## **D. Course Outline (TENTATIVE):**

1. Computer security Overview
  - Overview of Computer Security Concepts and Foundations
  - Threats, Attacks, and Assets
  - User Identification and Authentication
  - Access Control
2. Applied Cryptography
  - Block & Stream Ciphers
  - Symmetric and Asymmetric Cryptosystem
  - Public-Key Cryptography and Message Authentication
  - Message Integrity, Authentication, Digital Signature
3. Software Security and Trusted Systems
  - Buffer Overflow
  - SetUID Program vulnerabilities
  - Trusted Computing and Multilevel Security
4. Network Security
  - Internet Security Protocols and Standards
  - OSI Layer-wide Attacks
  - TCP Attacks, DNS Vulnerabilities
  - Packet Sniffing, Filtering, Firewall, IDS
  - Blockchain and Security
  - Smart Contracts
5. Selected Topics in Computer Security
  - Cyber Deception
  - Human Factors

## **E. Course Material**

1. William Stallings, Lawrie Brown, "Computer Security: Principles and Practice", Prentice Hall, 4th Edition.

2. Wenliang Du, "Computer and Internet Security, A Hands-on Approach", 2nd Edition

## F. COURSE ASSIGNMENTS AND GRADING (Tentative)

Your semester grade will be based on weighted score of assignments, quizzes, participation, exams and project.

### Weight distribution:

- 10% - Quiz and Participation (Q&P)
- 40% - Assignments (A)
- 25% - Mid-term exam (MTE)
- 25% - Final Exam (FE)

**Total Score** = 0.10 (Avg. Q&P) + 0.40 (Avg. A) + 0.25 (MTE) + 0.25 (FE)

### Grade Distribution:

100-89.5 = A 89.4-79.5 = B 79.4-69.5 = C 69.4-59.5 = D 59.4 and Below = F

**Assignments:** Regular assignments will be given which will require significant effort outside of class. The assignments are designed to challenge you by requiring that you apply learned concepts to new situations. You should start working on your assignment immediately after receiving it.

**Quizzes and Participation:** There will be regular quizzes and discussions in the class. The purpose of each quiz and discussion is to ensure that you are staying current with the class content and to verify that you have acquired the skills introduced in the class. The quizzes and discussion are not pre-scheduled. There will be **no make-up** on missed quizzes.

**Exams:** There will be two closed-book exams for this course.

Mid-Term Exam: March 20, 2024

Final Exam: May 1, 2024

**Late Policy:** All the assignments and projects are due at **midnight (11:59 PM)** of the provided date, unless otherwise stated. **You will have 5 grace days which you can use throughout the semester to get extension without penalty.** There will be a penalty of 20% points for each day after the deadline. No assignment will be accepted after 5<sup>th</sup> day of the deadline.

**Attendance:** This is a discussion-based course and your attendance in class is mandatory. Attendance in the course is determined by participation in the learning activities of the course. Your participation in the course is important for your not only learning and success but also to create a community of learners. Participation is determined by completion of the following activities:

- Reading/Viewing all course materials to ensure understanding of assignment requirements
- Participating in engaging discussion with your peers on the discussion
- Participating in scheduled Blackboard Collaborate sessions
- Other activities as indicated in the weekly modules

Because these activities are designed to contribute to your learning each week, they cannot be made up after their due date has passed.

## **TECHNOLOGY REQUIREMENTS**

Some course content is delivered via the Internet through the Blackboard learning management system. Ensure your UTEP e-mail account is working and that you have access to the Web and a stable web browser. Google Chrome and Mozilla Firefox are the best browsers for Blackboard; other browsers may cause complications. When having technical difficulties, update your browser, clear your cache, or try switching to another browser.

You will need to have access to a computer/laptop. You will need to download or update the following software: Microsoft Office, Adobe Acrobat Reader, Windows Media Player, QuickTime, and Java. Check that your computer hardware and software are up-to-date and able to access all parts of the course.

If you do not have word-processing software, you can download Word and other Microsoft Office programs (including Excel, PowerPoint, Outlook and more) for free via UTEP's Microsoft Office Portal. Click the following link for more information about [Microsoft Office 365](#) and follow the instructions.

**IMPORTANT:** If you encounter technical difficulties beyond your scope of troubleshooting, please contact the UTEP [Help Desk](#) as they are trained specifically in assisting with technological needs of students. Please do not contact me for this type of assistance. The Help Desk is much better equipped than I am to assist you!

## **ALTERNATIVE MEANS OF SUBMITTING WORK IN CASE OF TECHNICAL ISSUES**

I strongly suggest that you submit your work with plenty of time to spare in the event that you have a technical issue with the course website, network, and/or your computer. I also suggest you save all your work (answers to discussion points, quizzes, exams, and essays) in a separate Word document as a back-up. This way, you will have evidence that you completed the work and will not lose credit. If you are experiencing difficulties submitting your work through the course website, please contact the UTEP Help Desk. You can email me your back-up document as a last resort.

**COURSE COMMUNICATION:** How we will stay in contact with each other

Here are the ways we can keep the communication channels open:

- Office Hours: I will have office hours for your questions and comments about the course. My office hours are in-person, however, you can request a virtual meeting and I will send you a Zoom/Teams link. Please see the days and times at the top of this syllabus.
- Email: UTEP e-mail is the best way to contact me. I will make every attempt to respond to your e-mail within 24 hours of receipt. When e-mailing me, be sure to email from your UTEP student e-mail account and please put the course number in the subject line. In the

body of your e-mail, clearly state your question. At the end of your e-mail, be sure to put your first and last name, and your university identification number.

- Announcements: Check the Blackboard announcements frequently for any updates, deadlines, or other important messages.

## **ILLNESS PRECAUTIONS**

Please stay home if you have symptoms of a communicable illness. If you are feeling unwell, please let me know as soon as possible, so that we can work on appropriate accommodations.

## **NETIQUETTE**

As we know, sometimes communication online can be challenging. It's possible to miscommunicate what we mean or to misunderstand what our classmates mean given the lack of body language and immediate feedback. Therefore, please keep these netiquette (network etiquette) guidelines in mind. Failure to observe them may result in disciplinary action.

- Always consider audience. This is a college-level course; therefore, all communication should reflect polite consideration of other's ideas.
- Respect and courtesy must be provided to classmates and to the instructor at all times. No harassment or inappropriate postings will be tolerated.
- When reacting to someone else's message, address the ideas, not the person. Post only what anyone would comfortably state in a face-to-face situation.
- Blackboard is not a public internet venue; all postings to it should be considered private and confidential. Whatever is posted on in these online spaces is intended for classmates and professor only. Please do not copy documents and paste them to a publicly accessible website, blog, or other space.

## **Course Policies**

### **EXCUSED ABSENCES AND/OR COURSE DROP POLICY**

According to UTEP Curriculum and Classroom Policies, "When, in the judgment of the instructor, a student has been absent to such a degree as to impair his or her status relative to credit for the course, the instructor may drop the student from the class with a grade of "W" before the course drop deadline and with a grade of "F" after the course drop deadline." See academic regulations in the UTEP Undergraduate Catalog for a list of excuse absences. Therefore, if I find that, due to non-performance in the course, you are at risk of failing, I will drop you from the course. I will provide 24 hours advance notice via email.

### **INCOMPLETE GRADE POLICY**

Incomplete grades may be requested only in exceptional circumstances after you have completed at least half of the course requirements. Talk to me immediately if you believe an incomplete is warranted. If granted, we will establish a contract of work to be completed with deadlines.

## **ACCOMMODATIONS POLICY**

The University is committed to providing reasonable accommodations and auxiliary services to students, staff, faculty, job applicants, applicants for admissions, and other beneficiaries of University programs, services and activities with documented disabilities in order to provide them with equal opportunities to participate in programs, services, and activities in compliance with sections 503 and 504 of the Rehabilitation Act of 1973, as amended, and the Americans with Disabilities Act (ADA) of 1990 and the Americans with Disabilities Act Amendments Act (ADAAA) of 2008. Reasonable accommodations will be made unless it is determined that doing so would cause undue hardship on the University. Students requesting an accommodation based on a disability must register with the UTEP Center for Accommodations and Support Services (CASS). Contact the Center for Accommodations and Support Services at 915-747-5148, email them at [cass@utep.edu](mailto:cass@utep.edu), or apply for accommodations online via the CASS portal.

## **SCHOLASTIC INTEGRITY**

Academic dishonesty is prohibited and is considered a violation of the UTEP Handbook of Operating Procedures. It includes, but is not limited to, cheating, plagiarism, and collusion. Cheating may involve copying from or providing information to another student, possessing unauthorized materials during a test, or falsifying research data on laboratory reports. Plagiarism occurs when someone intentionally or knowingly represents the words or ideas of another as ones' own. Collusion involves collaborating with another person to commit any academically dishonest act. Any act of academic dishonesty attempted by a UTEP student is unacceptable and will not be tolerated. All suspected violations of academic integrity at The University of Texas at El Paso must be reported to the [Office of Student Conduct and Conflict Resolution \(OSCCR\)](#) for possible disciplinary action. To learn more, please visit [HOOP: Student Conduct and Discipline](#).

## **PLAGIARISM DETECTING SOFTWARE**

Some of your course work and assessments may be submitted to SafeAssign, a plagiarism detecting software. SafeAssign is used to review assignment submissions for originality and will help you learn how to properly attribute sources rather than paraphrase.

## **COPYRIGHT STATEMENT FOR COURSE MATERIALS**

All materials used in this course are protected by copyright law. The course materials are only for the use of students currently enrolled in this course and only for the purpose of this course. They may not be further disseminated.

**STUDENT SERVICES AND SUPPORT RESOURCES:** Where you can go for assistance

UTEP provides a variety of student services and support:

Technology Resources

- [Help Desk](#): Students experiencing technological challenges (email, Blackboard, software, etc.) can submit a ticket to the UTEP Helpdesk for assistance. Contact the Helpdesk via phone, email, chat, website, or in person if on campus.

#### Academic Resources

- [UTEP Library](#): Access a wide range of resources including online, full-text access to thousands of journals and eBooks plus reference service and librarian assistance for enrolled students.
- [University Writing Center \(UWC\)](#): Submit papers here for assistance with writing style and formatting, ask a tutor for help and explore other writing resources.
- [RefWorks](#): A bibliographic citation tool; check out the RefWorks tutorial and Fact Sheet and Quick-Start Guide.
- [The Miner Learning Center](#): Join peer-led study sessions in person or online to review content and discover study strategies in core curriculum courses.
- [UTEP Edge](#): UTEP's cross-campus framework for student success and empowerment – develops students' assets through high-impact experiences made possible by the expertise and dedication of faculty, staff, alumni, and community partners.

#### Individual Resources

- [Student Success Help Desk \(SSHD\)](#): Students experiencing challenges or obstacles to academic success including registration, financial, food, housing, and transportation resources may submit a ticket request assistance to [studentsuccess@utep.edu](mailto:studentsuccess@utep.edu)
- [Military Student Success Center](#): Assists personnel in any branch of service to reach their educational goals.
- [Center for Accommodations and Support Services](#): Assists students with ADA-related accommodations for coursework, housing, and internships.
- [Counseling and Psychological Services](#): Provides a variety of counseling services including individual, couples, and group sessions as well as career and disability assessments.
- [UTEP Food Pantry](#): Non-perishable food items are available to students who are currently enrolled in classes. Bring a Miner Gold Card to Memorial Gym, Room 105, Monday through Friday, 10 a.m. to 2 p.m.

### Course Topics (Tentative)

Week	Date	Topic	Assignment
Week 1	January 17	Syllabus, Introduction and Expectations	
Week 2	January 22	Linux Basics, Lab setup, Computer security fundamentals	
	January 24	Security Design Principles, Threat Models	
Week 3	January 29	User Authorization, Authentication and Access Control	Assignment 1: Password cracking & Set-UID
	January 31	Set-UID Privileged programs	
Week 4	February 5	Set-UID Privileged programs	
	February 7	Buffer Overflow: Introduction, Memory & Stack layout	
Week 5	February 12	Buffer overflow Attack: Demonstration	
	February 14	Buffer overflow Attack: Demonstration	Assignment 2: Buffer Overflow
Week 6	February 19	Return-to-Libc Attacks	
	February 21	Format String Vulnerability	
Week 7	February 26	Cryptography: Overview	Assignment 3: Cryptography
	February 28	Cryptography: Symmetric Ciphers and Asymmetric Ciphers	
Week 8	March 4	Cryptography: Symmetric Ciphers and Asymmetric Ciphers	
	March 6	Exam Review	
Week 9	March 11	<b>Spring Break</b>	
	March 13		
Week 10	March 18	Cryptography: Asymmetric Ciphers	
	March 20	Exam 1	Exam 1
Week 11	March 25	Cryptography: Data Integrity Algorithms	Assignment 4: MD5 Attack
	March 27	Network Security: Basics of networking	Assignment 5: Packet sniffing/Man-in-the middle attack
Week 12	April 1	Network Security: ARP, ICMP, Sniffing, IP Spoofing	
	April 3	Network Security: TCP, UDP, Session Hijacking	Assignment 6: TCP Attack
Week 13	April 8	DNS Cache Poisoning, ARP Cache Poisoning	
	April 10	IPsec, SSL, Firewalls	
Week 14	April 15	Firewalls, Intrusion Detection and Prevention systems	
	April 17	Web Security: OWASP top 10 attacks	
Week 15	April 22	Web Security: OWASP top 10 attacks	
	April 24	Exam Review	
Week 16	April 29	Selected Topics: Cyber deception, Security Models	
	May 1	Exam	Exam 2

