CS 4351: Computer Security

Instructor: Dr. Deepak Tosh
Semester: Fall 2020
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Class Hours: TR, 1:30 – 2:50 PM
Office Hours: TR, 10 – 11AM (Zoom)
Class Room: ONLINE (Zoom)

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 provides a broad introduction to 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, 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.

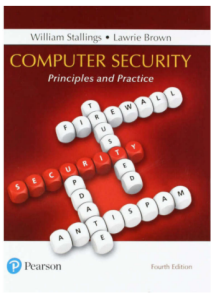
Synthesis and Evaluation

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. Ethics and Legal Aspects
    - Privacy and IP Protection
    - Incident Response

E. Required Materials/Books:



(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

Note: No Single textbook covers all the topics that we cover in the course. Necessary handouts/weblinks will be given based on the materials covered in the classroom.

You will also need regular access to a computer, stable/consistent Internet, Blackboard, Zoom, and your UTEP email account.

F. Course Assignments and Grading (Tentative):

Your semester grade will be based on a weighted combination of homework assignments, quizzes, participation, and exam. The approximate percentages for each category are given in the following and the final grade will be calculated using weighted average of these items.

Grade Distribution

- 20% - Quizzes and Participation (QaP)
- 35% - Homework and Lab Assignments (Assign)
- 20% - Midterm Exam (Midterm)
- 25% - Final Exam (Final)

Total Score = 0.2 (Avg. QaP) + 0.35 (Avg. Assign) + 0.2 (Midterm) + 0.25 (Final)

Total Score	90-100	80-89	70-79	60-69	59 and Below
Grade	A	B	C	D	F

Important Note: You will have *one week to appeal* for your grades after the graded assignments/tests are returned. So, please keep this in mind if you think that there is a problem/issue with the grading of your work.

Late Submission Policy:

- No extension on the assignment submission due dates will be given.
- Late submissions will be penalized with 10% deduction per day up to a maximum of 5 days. Submission after 5 days of due date will receive 0 points.

a. Quizzes and Participation

Since it is an online course, we will measure attendance through participation (10% weightage). The students will be required to participate in **bi-weekly** discussion boards – both creating their own post related to a common theme induced by the instructor and at least two responses to peers’ posts. Within a week from the instructor’s poste, the students must create a post related

to topic posted by the Instructor, and all the students are required to respond at least two posts by **next** 7days.

In addition, there will be **weekly quizzes** (10% weightage), posted every Saturday noon and will be available until midnight. Students must allocate 10-15 minutes on the Saturdays (between 12pm – 12am) to attempt the quizzes.

b. Homework Assignments

The assignments are supposed to be submitted individually. No group submission will be accepted. Students are free to discuss about the assignments in groups, but they should complete the tasks alone. Uniqueness and plagiarism will be strictly checked in the submitted reports. So, ensure you understand the assignment tasks well beforehand and please DO NOT COPY from other colleagues. You can refer external materials to solve the problems but ensure to include REFERENCE LINKS in the reports.

> ***Note:*** Students may be asked to demonstrate their assignments and answer additional follow up questions, whenever the instructor needs to verify the originality of their works.

A majority of the assignments are referred from the textbook of "Wenliang Du: Computer Security, A Hands-on Approach". Some of these labs can be found at SEEDLAB website. Many of the experiments are conducted locally set VirtualBox environment using 3 Ubuntu 16.04 (U-16) VMs provided in the SEEDLAB Setup. You can follow the setup link to install the environment.

- SEED VM can be downloaded using this link.
- Manual for installing SEEDVM in VirtualBox can be found here.

c. Midterm and Final Exam

Midterm exam is scheduled to be on 13th October 2020 and Final exam will be conducted on the day of UTEP's allotted day, i.e. 10th December 2020. Each exam will be taken in blackboard and the estimated duration will be 80-100 minutes. The format of the exams will be further discussed in the classes and announced later.

Note: The tests will be open for 12 hours on the exam day and the students must take the test at one stretch. Attempt to retake the test would erase their previous attempt(s) and the question set will be reinitialized.

G. Technology Requirements (Meeting Link)

Class will meet at the scheduled time on **Zoom** (already *available* at *left-side menu in Blackboard*). The course content will be posted in the Blackboard learning management system. Therefore, please ensure to have stable Internet and a laptop with working microphone & webcam to

connect with instructor and accessing course materials. If you encounter technical difficulties beyond your scope of troubleshooting, please contact the Help Desk as they are trained specifically in assisting with technological needs of students.

H. Netiquette and Standards of Conduct

Students are expected to conduct themselves in a professional and courteous manner, as prescribed by the Standards of Conduct. Students may discuss work assignments and programming exercises in a general way with other students, but the solutions must be done independently. Similarly, groups may discuss group project assignments with other groups, but the solutions must be done by the group itself. Graded work should be unmistakably your own. You may not transcribe or copy a solution taken from another person, book, or other source, e.g., a web page. Professors are required to -- and will -- report academic dishonesty and any other violation of the Standards of Conduct to the Dean of Students. Some **key points** to remember:

- Always consider audience. Remember that members of the class and the instructor will be reading all the postings.
- Respect and courtesy must be provided to classmates and to 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 F2F 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. If students wish to do so, they have the ethical obligation to first request the permission of the writer(s).

I. Academic Dishonesty and Code of Honor

Academic dishonesty is strictly 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 HOOP: Student Conduct and Discipline.

Note: Students are required to agree to the UTEP College of Engineering's Honor Code. https://www.utep.edu/engineering/academic-programs/undergraduate-programs/undergraduate-honors-code.html

J. Disabilities:

UTEP 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.

K. STUDENT RESOURCES

UTEP provides a variety of student services and support:

- 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.
- 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.
- University Writing Center (UWC): Submit papers here for assistance with writing style and formatting, ask a tutor for help and explore other writing resources.
- Math Tutoring Center (MaRCS): Ask a tutor for help and explore other available math resources.
- Military Student Success Center: UTEP welcomes military-affiliated students to its degree programs, and the Military Student Success Center and its dedicated staff (many of whom are veterans and students themselves) are here to help personnel in any branch of service to reach their educational goals.
- RefWorks: A bibliographic citation tool; check out the RefWorks tutorial and Fact Sheet and Quick-Start Guide.