UNIVERSITY OF HOUSTON
Department of Electrical and Computer Engineering
ECE 5397/6397 – Introduction to Cybersecurity
Spring Semester 2022

*Course***:** Introduction to Cybersecurity, Class Number ECE 5397/6397

Instructor: Dr. Miao Pan mpan2@uh.edu
Office: W342 Engineering Bldg. 2 (D3); Phone: (713) 743-0557;
Office Hours: TTh 2:00 pm - 4:00 pm or by appointment

Required Text: Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security: Private Communication in a Public World", 2nd Edition, Prentice Hall, 2002. ISBN-10: 0-13-046019-2. ISBN-13:978-0-13-046019-6.

Course Web URL: Zoom ID: 916 722 1115, Blackboard

Recommended Materials for Supplementary Self-Study
Sets of self-study materials and references are available on the web, as described at the end of this document. In addition, you are strongly encouraged to acquire a legal copy of a good network security textbook. A good textbook can supplement and complement the lecture materials. However, homework assignments will not be assigned from any specific textbook. Thus, you may acquire any edition of the textbook, and it should be satisfactory.

The required textbook is:
- Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security: Private Communication in a Public World", 2nd Edition, Prentice Hall, 2002. ISBN-10: 0-13-046019-2. ISBN-13:978-0-13-046019-6.

Some reference books include:
- Charles P. Pfleeger and Shari Lawrence Pfleeger, "Security in Computing", 4th Edition, Prentice Hall, 2006. ISBN-10: 0-13-239077-9. ISBN-13: 978-0-13-239077-4.
- William Stallings, "Cryptography and Network Security: Principles and Practices", 4th Edition, Prentice Hall, 2005. ISBN-10: 0-13-187316-4. ISBN-13: 978-0-13-187316-2.
- Christof Paar and Jan Pelzl , "Understanding Cryptography: A Textbook for Students and Practitioners", ISBN-13: 978-3642446498. ISBN-10: 3642446493
- Ross Anderson, "Security Engineering: A Guide to Building Dependable Distributed Systems", 2nd Edition, Prentice Hall, 2008. ISBN-10: 0-47-006852-3. ISBN-13: 978-0-47-006852-6.

Prerequisites
The following requirements must be met before enrolling in Introduction to Cybersecurity. In each course you must have earned a grade of "C-" or better, except the English courses for which a "D-" or better is required.

Prerequisites

ENGI 1100 - Intro to Engineering   ECE 3331 - Programming Applications in ECE
MATH 2433 - Calc. III

Blackboard
We will be using the Blackboard Learn web site (http://www.uh.edu/blackboard) for posting of grades and email only. All documents and handouts will be available on the website. We will assume that your UH e-mail alias (joejones@uh.edu) is pointed to a working e-mail server, and that you are available at that address.

GENERAL INFORMATION

Catalog Description
Introduction to Cybersecurity. Cr. 3 (3-0). Prerequisites: ENGI 1100, ECE 3331 and MATH 2433. Basic security concepts. Cryptography basics. Computer security, and network security. Security analysis.

Course Topics
- Basic security concepts
  - Confidentiality, integrity, availability, etc.
- Cryptography basics
  - Symmetric key cryptography
  - Hashes and message digests
  - Public key cryptography
  - Differential Privacy (optional)
- Computer security
  - Vulnerabilities and exposures
- Network security
  - Authentication mechanisms and standards (Kerberos, public key infrastructure)
  - IPsec
  - SSL/TLS
  - Firewalls and IDS
  - Web security
- Selected applications
  - Cellular network security, WLAN security, Smart Grid security, etc.

Expected Course Outcomes:
Students who successfully complete this course are expected to meet the following course outcomes.
- Students will add to their knowledge-base in the fundamentals of computer engineering, especially in the area of cybersecurity, in part by gaining a greater understanding of key engineering concepts, such as equivalent encryption and decryption techniques. Students will use this knowledge and understanding to solve security problems such as arising in computer engineering. (student outcome e)
- Students will further develop their basic skills of problem solving and critical thinking by learning techniques such as cryptography algorithms and their applications in security protocol design. They will apply this knowledge of mathematics, science and engineering to efficiently solve cybersecurity problems. (student outcome a)
- Students will continue to develop their ability to choose between various approaches and to learn to take systematic approaches to difficult problems, and therefore identify, formulate, and solve engineering problems efficiently. (student outcome e)

- Students will demonstrate an appropriate level of attention to detail and the use of clear, appropriate notation, which will facilitate their ability to communicate effectively with technical colleagues. (student outcome g)

Introduction to Cybersecurity is designed to introduce students to fundamental concepts in cybersecurity and, more generally, in computer engineering. The *Goal* of this course is to let students get familiar with basic security concepts and cryptographic techniques, learn basic computer and network attacks and defense techniques, and have the capability to understand/do some security protocol designs. Since you will be using these ideas in all aspects of your career as an electrical engineer, both in the classroom and in the workplace, it is important that you learn the conceptual framework presented in *Introduction to Cybersecurity* as thoroughly as possible.

Academic Honesty Policy
Students in this course are expected to follow the *Academic Honesty Policy* of the University of Houston. It is your responsibility to know and follow this policy. You must sign the Academic Honesty Statement on the last page of this handout, detach it, and submit it by Wednesday, January 28, 2015. If you fail to do this, you may be dropped from the course. For more information, see the *Academic Honesty* in the *Undergraduate Catalog* which is available on-line at
http://catalog.uh.edu/content.php?catoid=8&navoid=1352

Religious Holy Days
Students whose religious beliefs prohibit class attendance on designated dates or attendance at scheduled exams may request an excused absence. To do this, you are **strongly encouraged** to request the excused absence, in writing, by Wednesday, February 4, 2015. Please submit this written request to your instructor to allow the instructor to make appropriate arrangements.
More information can be found at
http://www.uh.edu/dos/studenthandbook/academicpolicy/a_holydays.html

Students with Disabilities
Students with recognized disabilities will be provided reasonable accommodations, appropriate to the course, upon documentation of the disability with a *Student Accommodation Form* from the *Center for Students with Disabilities*. To receive these accommodations, you must request the specific accommodations, by submitting them to the instructor in writing, by Wednesday, Wednesday, February 4, 2015. Students who fail to submit a written request will not be considered for accommodations. More information, can be found at
http://www.uh.edu/dos/studenthandbook/academicpolicy/a_disability.html

Homework
Since doing homework is important, we will be collecting and grading it. Some students may be tempted to copy their homework from a fellow student, which obviously defeats the purpose of doing homework. At the end of the semester, the grades you obtained on your homework

assignments will count a few percent toward your final average. We will make the final determination of exactly how much they count at the end of the semester. However, it is important for you to understand that you cannot pass the course on the basis of homework assignments. Our experience is that if you are copying the homework, or simply not doing it, you will not do well on the exams and quizzes. Since the exams and quizzes will count far more than the homework assignments, the homework grade cannot raise your average sufficiently for you to pass the course.

Attendance
Attendance at all classes is expected and required. The instructor may, if he chooses, take attendance in any class, at any time during the class. The instructor may do this as many times per class period as he chooses, without warning. The attendance grade can be included in the grade for the course.

Exams
There will be one 90 minute midterm exam and one 2 hours final exam on the date listed in the course schedule, which is available as a separate document.

Project
Since this is an ECE 5397/6397 course, graduate students are required to do an extra project. It can be either writing a survey based on some selected cutting-edge research papers in cybersecurity area, or implementing some security protocols, which may involve programming work using Java, C++, or Python. More detail requirements and additional materials of the project will be available on the Blackboard.

Conduct of Examinations
Exams are closed book, closed notes, unless otherwise announced A one-page crib sheet, using both sides of an 8.5" by 11" sheet of paper, will be allowed for each of the exams. Note that the number of crib sheets will not increase during the semester. You may bring any calculator to the exams and quizzes. **No makeup examinations will be given. If you have a medical emergency you should call your instructor as soon as possible, preferably before the examination. Medical documentation will be required in all such cases.**

All work must be done on the examination forms provided for that purpose. The seats for exams will be randomly assigned. All of these regulations are designed to reduce the possibility of cheating, so that all students will be graded as fairly as possible.

Grading Policy
Grades will be determined on the basis of exams, attendance, and submitted homework grades with the following **approximate** weights. The actual weights will be fixed at the end of the semester.

- Undergraduate Students:
  Homework   15%
  Group Project (2)   20%

Mid-Exam	30%
Final Exam:	35%

- Graduate Students:

Homework	15%
Project	20%
Mid-Exam	30%
Final Exam:	35%

Grade Point Rule
The following **<u>approximate</u>** grade point scale will be used in determining your grade. This scale may be modified somewhat, but is included here so that you will have a general idea of how well you are doing in the course. The final grade scale will be determined at the end of the semester.

90:A 85:A- 80:B+ 77:B 74:B- 71:C+ 67:C 60:C- 55:D+ 50:D 45:D- <45:F

Grade Posting
You may find out your grade in the course on-line using PeopleSoft. Normally, the grades are available about one week after the final exam. The instructor is not allowed to give out grades over the phone or by email. During the semester, grades will be posted on Blackboard in a secure manner, i.e., so that only you will have access to your grades. Final grades will also be posted on Blackboard at the end of the semester; however, the official grade reporting is done on PeopleSoft, not on the Blackboard.

Withdrawal Policy
The withdrawal dates listed in the Academic Calendar section of the *Class Schedule* will be followed strictly. You may drop the course without receiving a grade until ***, 2016, which is the University's last day to drop without receiving a grade. After this date and until Monday April 6, which is the University's last day to drop, you may drop with a W if you have not exceeded your total W limit (the limit applies to undergraduate students only). Grades of Incomplete (I) will be given only when a small portion of the course has not been completed for a good reason. If the material has been completed, an "I" grade cannot be given. Detailed information about these issues is available in the University of Houston Undergraduate Catalog.

Documents on the Web and LAN
Some additional materials not on Blackboard may be found at:
http://www.egr.uh.edu/courses/ece/Ece5397/.

Special Requirements due to COVID

<u>Excused Absence Policy</u>

Regular class attendance, participation, and engagement in coursework are important contributors to student success. Absences may be excused as provided in the University of Houston Undergraduate Excused Absence Policy and Graduate Excused Absence Policy for reasons including: medical illness of student or close relative, death of a close family member, legal or government proceeding that a student is obligated to attend, recognized professional and educational activities where the student is presenting, and University-sponsored activity or athletic competition. Under these policies, students with excused absences will be provided with an opportunity to make up any quiz, exam or other work that contributes to the course grade or a satisfactory alternative. Please read the full policy for details regarding reasons for excused absences, the approval process, and extended absences. Additional policies address absences related to military service, religious holy days, pregnancy and related conditions, and disability.

Recording of Class

Students may not record all or part of class, livestream all or part of class, or make/distribute screen captures, without advanced written consent of the instructor. If you have or think you may have a disability such that you need to record class-related activities, please contact the Center for Students with DisABILITIES. If you have an accommodation to record class-related activities, those recordings may not be shared with any other student, whether in this course or not, or with any other person or on any other platform. Classes may be recorded by the instructor. Students may use instructor's recordings for their own studying and notetaking. Instructor's recordings are not authorized to be shared with *anyone* without the prior written approval of the instructor. Failure to comply with requirements regarding recordings will result in a disciplinary referral to the Dean of Students Office and may result in disciplinary action.

Synchronous Online Courses: This course is being offered in the Synchronous Online format. Synchronous online class meetings will take place according to the class schedule. There is no face-to-face component to this course. In between synchronous class meetings, there may also be asynchronous activities to complete (e.g., discussion forums and assignments). This course will have a final exam per the University schedule. The exam will be delivered in the synchronous online format, and the specified date and time will be announced during the course. Prior to the exam, descriptive information, such as the number and types of exam questions, resources and collaborations that are allowed and disallowed in the process of completing the exam, and procedures to follow if connectivity or other resource obstacles are encountered during the exam period, may be provided.

Helpful Information

      COVID-19 Updates: https://uh.edu/covid-19/

      Coogs Care: https://www.uh.edu/dsaes/coogscare/

      Laptop Checkout Requests: https://www.uh.edu/infotech/about/planning/off-campus/index.php#do-you-need-a-laptop

      Health FAQs: https://uh.edu/covid-19/faq/health-wellness-prevention-faqs/

Student Health Center: https://uh.edu/class/english/lcc/current-students/student-health-center/index.php

ECE 5397/6397

Academic Honesty Statement & Email Agreement

Name: (printed) _____

Confirm that the following statements are true and then sign and date below.

Academic Honesty Statement

- ✓ I have read the University of Houston Academic Honesty Policy contained in the UH Undergraduate Catalog available at http://catalog.uh.edu/content.php?catoid=8&navoid=1352
- ✓ and the ECE 5397/6397 Position on Academic Honesty contained in the Course Policy Document and available on the course web site and agree to abide by its provisions. I understand that the *Department of Electrical & Computer Engineering* takes academic honesty very seriously and, in the cases of violations, penalties may include <u>suspension</u> from the University of Houston.

UH E-mail Alias Agreement

- ✓ I have read the University of Houston Information Technology website discussing UH e-mail aliases (http://www.uh.edu/infotech/services/accounts/email/update-student-address/index.php). I understand how to use this alias to receive e-mail through my outside provider.

- ✓ I understand that it is my personal responsibility to configure this alias properly to receive mailings from the university.

- ✓ I understand that the ECE department will use this e-mail alias for all official correspondence.

Signature: _____

UH E-mail Alias: _____

Date: _____

Submit this form to your professor by Wednesday February 4, 2016.

Blackboard Login Information

Please note: **Not all instructors choose to use the Blackboard course management system.**

Blackboard:

Bb Login:	**accessUH.uh.edu** or **elearning.uh.edu** or **uh.edu/blackboard**
Username:	same as your **CougarNet UserID***
Password:	same as your **CougarNet Password****

Reset **CougarNet**
Password: *(3 options)*

- go to **https://accessUH.uh.edu** > **Change CougarNet Password** >
  select *"I forgot my CougarNet password or need it reset."* > follow prompts.
- go to **http://uh.edu/password** > select *"I forgot my CougarNet password or need it reset."* > follow prompts.
- go to **www.uh.edu/infotech** > Password Reset > select *"I forgot my CougarNet password or need it reset."* > follow prompts.

Change **CougarNet**
Password: *(3 options)*

- go to **https://accessUH.uh.edu** > **Change CougarNet Password** >
  select *"I need to change my CougarNet password."* > follow prompts.
- go to **http://uh.edu/password** > *"I need to change my CougarNet password."* > follow prompts.
- login to **CougarNet** > **Control+Alt+Delete** > click **Change Password** in dialog box > enter **Old Password** > enter **New Password** > **Confirm**.

Need Help?

Contact the UIT Support Center
 - *by phone*: 713-743-1411
 - *online*: **support@uh.edu**
 - *live chat*: **www.uh.edu/infortech/livechat**
 - *in person*: Room 58 (basement) or 1st floor of MD Anderson Library
 - *UH Help* tab in Blackboard

If you do not know your CougarNet UserID, you may request it at **https://accessuh.uh.edu, contact UIT Support Center at 713-743-1411, or go to the Engineering Computing Center (ECC) front desk (W-129, Engineering Bldg. 2) with your Cougar Card - ECC staff can help you.*
**If you do not know your CougarNet password, see options under "Reset CougarNet Password" above.

UNIVERSITYof **HOUSTON**
CULLEN COLLEGE of ENGINEERING
Engineering Education Resource Center