ITEC5102/SYSC5500- Designing Secure Networking and Computer Systems

Fall 2020 – online course - (0.5 credit)

September 2, 2020

- Instructor: Dr. Ashraf Matrawy - www.csit.carleton.ca/~amatrawy
- Please email through CULearn.
- Lectures: Online using Zoom. For time check Carleton's schedule
- Office hours: MW 12:0-13:00. Send an email to ashraf.matrawy@carleton.ca (please include "ITEC5102 or SYSC5500 " in your subject) during office hours, and I will send you a link to a Zoom meeting if your question cannot be answered by email.
  Office hours might change. Announcements will be made on CULearn.

Calendar description
Network security with coverage of computer security in support of networking concepts. Security issues in data networks at different protocol layers. Routing security, worm attacks, and botnets. Security of new mobile networks and emerging networked paradigms such as social networks and cloud computing.

Course Objectives
The course covers various security issues in data networks and computer systems. Essentials of information security are reviewed as an introduction to the course. The main body of the course investigates network security from different perspectives by considering the protocol layers and different types of network architectures. Issues with protocol security and different classes of attacks and defences will also be addressed. Finally, security issues in emerging paradigms and trends such as cloud computing and software defined networking may be addressed.

Learning outcomes
1. Learn about different topics in network security to cover background for graduate students working on various topics
2. Learn in depth in one security area through the project
3. Presentation skills gained and improved though project deliverables.

Pre-requisites
A senior undergrad or a graduate networking course (e.g. SYSC4602 or SYSC5201 or equivalent), an operating systems course, or instructor's permission. It is crucial that you have this background. The course will not review basics of networking or operating systems.

Textbooks
- Stallings and Brown, "Computer Security: Principles and Practice", 4th Edition, Addison Wesley. Book resource page http://williamstallings.com/

Other references
- Computer Security and the Internet: Tools and Jewels, Paul C. van Oorschot. 2020, Springer. 365 pages plus frontmatter.
- Kurose and Ross, "Computer Networking: A Top-Down Approach", 7th Edition, Addison-Wesley

Material

- Course material, relevant links, and announcements will be posted on CULearn. For University of Ottawa students, please check http://gradstudents.carleton.ca/wp-content/uploads/Access-to-CULearn.pdf for access to CULearn.
- I do not usually post my teaching slides for a graduate course. Students should take their own notes and create their own material on the subject. The exam in this course is either a take-home or an open-book exam, therefore, it is up to the students to create their own studying material for it. Some standard slides might be posted but for some topics, links to relevant references and other useful resources will be posted on CULearn. Students should read the material on the reading lists.

List of Topics

The course will cover as much as possible from the following topics depending on the time and feedback from the students.

- Review of fundamental security concepts
- Short introduction to cryptography
- Security of lower-layer protocols vs. upper-layer protocols
- Overview of classes of attacks: examples of worms and botnets
- Firewalls, IDSs and other defences
- Wireless and mobile network security
- Virtual Private Networks and tunneling
- Cloud Computing Security
- Topics in Internet of Things security

Evaluation

- Take home exam. (**Assigned December 11th, due December 23rd**)   40%
- Project:
  1. Proposal   10%
  2. Progress presentations   15%
  3. Results presentations   15%
  4. Final report   20%

Schedule for the project deliverables will be posted on CULearn

Project

The project topics will be discussed in class and should be related to one of the areas discussed in class. High quality deliverables are expected. Each deliverable builds on the previous one. The final report is in a research paper. Therefore:

- Projects are done in a group of two (or more upon instructor's approval) students. Students in the same group get the same mark for the proposal and final report and individual marks for the presentations. The instructor will evaluate individual contributions by oral exams, code inspection, or other means appropriate for the nature of the project.
- The proposal is expected to be <u>two pages only</u> (point 10 font, and using conference double-column format). It should include a title, abstract, introduction, problem statement, work plan and expected final outcome. All project topics should be approved by the instructor based on the submitted proposal. If a revision is needed the students will be informed of a new deadline for the revised proposal.

- The progress presentations should provide an explanation of the progress and some preliminary results. Feedback provided on this presentation should be taken into account by the students while working towards the next steps.
- Students are required to present results and conclusions in class and receive feedback to prepare their final Report.
- The final report (deliverable 4) should be a complete research paper with a maximum of <u>eight pages</u>. The only exception to deliverable length rule is the limited case of comparative survey studies that is approved by the instructor first.

Project testing and experimentation rules

The projects must never involve testing on actual websites or live/operational networks. The students must not try to use any malware or develop any. Such activities are strictly not allowed in the course. By submitting a project proposal, the students confirm that they understand and agree to follow these rules. Before the proposal, <u>each</u> student should submit a statement that confirms that he/she read, understood, and will follow all the rules in the course outline. Students will not be allowed to start of the project without this statement. Apart from this statement, all project deliverables are submitted as one submission for the entire group.

Plagiarism and proper use of resources and contents

Plagiarism is a serious instructional offense that will not be tolerated. Please refer to the section on instructional offenses in the Graduate Calendar for additional information. It is very important to note that copying from other papers for your project is strictly prohibited even if it is something for the background section. Any work submitted by the student will be assumed to be the creation of the student. If it turns out to be copied (even parts of it), this may result in receiving an "F" in addition to any other university-imposed sanctions. In addition, the students will ensure that they have the right to use any resources or tools (e.g. software) that they use in their projects and have the right the publish results obtained through these resources or tools. The students should not submit work they have done for other courses or for their thesis to receive credit in this course. Also, students should not bring or use anything proprietary or confidential (for example from companies they work for or have worked for) into their project. The student will also assume FULL responsibility of any problems resulting from contributing such proprietary or confidential material or plagiarized work to a joint publication with the instructor.

Students' responsibility
- **Lectures will be online using Zoom. They will be recorded and potentially posted online later. Students should be aware of that. Using chat during the lecture will be appear to all other participants. The instructors will try not post the chat but this cannot be guaranteed. Email the instructor privately if you have a private question during the lecture.**
- Schedule: All important dates and deadlines are posted on CULearn. It is your responsibility to make sure you know when the exams, labs, and assignments are set.
- Deadlines are set to be respected, no individual extensions will be granted unless for a university approved reason (e.g. medical) and by following the university formal process for such cases. In certain cases, **upon instructor's approval, submissions that are late by less than 24 hours will be accepted subject to a 25% penalty.**
- No reminders will be sent for any deadlines. Announcements will be sent only in case of changes; otherwise the dates on CULearn are fixed.
- Email: students are encouraged to meet me during office hours. Email through CULearn and expect a reply usually around the next office hour time. Use the email above if you want to set an

appointment with me. Please keep phone calls to urgent issues only. **Please do not send an email in the last few hours before a deadline and expect an immediate response.**

- You are responsible for making sure your Carleton email is working and you should check it regularly. Also you should make sure that you check the course's CULearn email regularly.
- The deliverables are to be submitted through CULearn in PDF format only. Using Latex is strongly encouraged but not required. For group submissions, only one copy is needed and could be submitted by either partner. In case of multiple submissions from the same group, the latest one will be considered unless a justification is provided for considering a prior submission.

Group work

Carleton School of Information Technology encourages group assignments in the school for several reasons. They provide you with opportunities to develop and enhance interpersonal, communication, leadership, followership and other group skills. Group assignments are also good for learning integrative skills for putting together a complex task. Your professor may assign as many group tasks/assignments/projects as necessary in this course. Before embarking on a specific problem as a group, it is your responsibility to ensure that the problem is meant to be a group assignment and not an individual one.

ACADEMIC ACCOMMODATION

You may need special arrangements to meet your academic obligations during the term. For an accommodation request, the processes are as follows:

Pregnancy obligation

Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website **carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf**.

Religious obligation

Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website **carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf**

Academic Accommodations for Students with Disabilities

If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or pmc@carleton.ca for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with your instructor as soon as possible to ensure accommodation arrangements are made. For more details, visit the Paul Menton website **carleton.ca/pmc**.

Survivors of Sexual Violence

As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and where survivors are supported through

academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit **carleton.ca/sexual-violence-support**.

Accommodation for Student Activities

Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit **https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf**

ACADEMIC INTEGRITY

The University Senate defines plagiarism in the regulations on instructional offenses as "to use and pass off as one's own idea or product work of another without expressly giving credit to another." Borrowing someone else's answers, unauthorized possession of tests or answers to tests, or possession of material designed in answering exam questions, are also subject to university policy regarding instructional offences. Students who post their code online are making themselves a potential party to plagiarism and are subject to the consequences. For more information on Carleton University's Academic Integrity Policy, consult *https://carleton.ca/secretariat/wp-content/uploads/Academic-Integrity-Policy.pdf*

COURSE COPYRIGHT

Student or professor materials created for this course (including presentations and posted notes, labs, case studies, assignments and exams) remain the intellectual property of the author(s). They are intended for personal use and may not be reproduced or redistributed without prior written consent of the author(s).

IMPORTANT DATES TO REMEMBER – Academic Year 2020-2021

WITHDRAWALS

The last day to withdraw from fall term courses with a full fee adjustment is **September 30, 2020**. Withdrawals after this date will create no financial change to fall term fees and will result in a permanent notation of WDN appearing on your official transcript.

The last day to withdraw from fall term courses is **December 11, 2020**.

OFFICIAL FINAL EXAMINATION PERIOD

Fall term: **December 12-23, 2020 –** Examinations are normally held all seven days of the week.

For a complete listing of academic and financial dates and deadlines for the 2020/2021 academic year, please visit https://carleton.ca/registrar/registration/dates-and-deadlines/.