ECE 8860 Sections 1 (843) CPSC 8860 Sections 1 (843)
Contemporary topics in Computer Security – *Distributed Denial of Service*
Spring 2020

Instructor and contact information:
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Office hours Brooks:
    Monday 4:00 PM – 5:00 PM
    Google hangout location TBD
    Or by appointment
Office hours Yu:
    TBD
Office hours Bhat:
    TBD
Class meeting times and location:
    Mon/Wed 5:15 PM – 6:30 PM
    Riggs 223 and Zucker Center TBD

Attendance policy:
Unless otherwise stated on the course specific syllabus, **students are expected to attend class, and to arrive on time.**

    In the event of an **emergency**, students should contact the course instructor, preferably before class or the exam. Students should speak with instructors regarding any scheduled absence as soon as possible and develop a plan for any make-up work, if allowed by the instructor. It is the student's responsibility to secure documentation of emergencies, if required by the instructor. A student with an excessive number of absences may be withdrawn at the discretion of the course instructor.

    If the instructor is late, students are expected to wait 15 minutes for the instructor to arrive.

Inclement Weather Policy
Any exam that was scheduled at the time of a class cancellation due to inclement weather will be given at the next class meeting unless contacted by the instructor. Any assignments due at the time of a class cancellation due to inclement weather will be due at the next class meeting unless contacted by the instructor. Any extension or postponement of assignments or exams must be granted by the instructor via email or Canvas within 24 hours of the weather related cancellation.

Access Accommodations:
Clemson University values the diversity of our student body as a strength and a critical component of our dynamic community. Students with disabilities or temporary injuries/conditions may require accommodations due to barriers in the structure of facilities, course design, technology used for curricular purposes, or other campus resources. Students who experience a barrier to full access to this class should let the professor know, and make an appointment to meet with a staff member in Student Accessibility Services as soon as possible. You can make an appointment by calling 864-656-6848, by emailing studentaccess@lists.clemson.edu, or by visiting Suite 239 in the Academic Success Center building. Appointments are strongly encouraged – drop-ins will be seen if possible, but there could be a significant wait due to scheduled appointments. Students who receive Academic Access Letters are strongly encouraged to request, obtain and present these to their professors as early in the semester as possible so that accommodations can be made in a timely manner. It is the student's responsibility to follow this process each semester. You can access further information here: https://www.clemson.edu/academics/studentaccess/index.html.

Academic integrity:
As members of the Clemson University community, we have inherited Thomas Green Clemson's vision of this institution as a 'high seminary of learning.' Fundamental to this vision is a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating, or stealing in any form. In instances where academic standards may have been compromised, Clemson University has a responsibility to respond appropriately to charges of violations of academic integrity. Further information on Academic Integrity can be found in the *Undergraduate Announcements* and in the *Graduate School Policy Handbook*.

Anti-Harassment and Non-Discrimination
Clemson University is committed to a policy of equal opportunity for all persons and does not

discriminate on the basis of race, color, religion, sex, sexual orientation, gender, pregnancy, national origin, age, disability, veteran's status, genetic information or protected activity in employment, educational programs and activities, admissions and financial aid. This includes a prohibition against sexual harassment and sexual violence as mandated by Title IX of the Education Amendments of 1972. This policy is located at http://www.clemson.edu/campus-life/campus-services/access/title-ix/. Ms. Alesia Smith is the Clemson University Title IX Coordinator, and the Executive Director of Equity Compliance. Her office is located at 110 Holtzendorff Hall, 864.656.3181 (voice) or 864.656.0899 (TDD).

Online Courses
In an online course, you will interact with the content, instructor, and/or classmates on at least a weekly basis through course assignments, asynchronous discussions and/or synchronous sessions as indicated on the course specific syllabus. Further resources for online courses may be found here: http://www.clemson.edu/online/students/.
Computing technology questions may be sent to ITHELP@clemson.edu.

Emergency Procedures
Emergency procedures have been posted in all buildings and on all elevators. Students should review these procedures for their own safety. Students are required to monitor their university email (see https://www.clemson.edu/studentaffairs/student-handbook/universitypolicies/email-communications.html) thus establishing this as a convenient method for official communication to students. Students are also encouraged to enroll in CU-Safe alerts. See https://www.clemson.edu/cusafety for more information.

Copyright Statement
Materials in some of the courses are copyrighted. They are intended for use only by students registered and enrolled in a particular course and only for instructional activities associated with and for the duration of the course. They may not be retained in another medium or disseminated further. They are provided in compliance with the provisions of the Teach Act. Students should be reminded to refer to the Use of Copyrighted Materials and "Fair Use Guidelines" policy in on the Clemson University website for additional information: https://www.clemson.edu/library/.

Objectives and outcomes:
Denial of Service (DoS) attacks are an important weakness of the current Internet. This course is meant to give the students understanding of how these attacks occur, they can be detected and to mitigate them.
 Students will be taught about normal Internet traffic time series and how difficult it is to create, model, and analyze Internet traffic. Students will use software defined networking primitives to set up experiments. Network attacks will be executed and mitigated.

Resources:
The professor will provide materials. External research and reading is expected. References will be provided with the course.

Assignments:

Assignment	Due	Percent grade
Lab report 1	2/3/2020	10%
Lab report 2	2/12/2020	10%
Midterm	2/24/2020	20%
Lab report 3	3/4/2020	10%
Lab report 4	4/1/2020	10%
Lab report 5	4/22/2020	15%
Final	4/27/2020	25%
Total		100%

Grading:
    A – 90 or above
    B – 80 to 89
    C – 70 to 79
    D – 60 to 69
    F – Below 60

Date	Lecture topic	Reference	Assignment	Due
1/8/2020	SDN lecture and network topology	Chapters 6, 11, 14.1, 14.2, 14.3		
1/13/2020	Overview and syllabus	Chapter 1		
1/15/2020	Lab 1 – Traffic sniffing		Lab report 1	02/03/20
1/20/2020	MLK Day			
1/22/2020	History and Motivation of DDoS	Last day to drop Chapters 2 and 3		
1/27/2020	Importance of background traffic / DDoS legal discussion	Chapters 4 and 5		
1/29/2020	Lab 2 spoofing		Lab Report 1	02/03/20
2/3/2020	Botnet and IoT background	Chapters 2 and 3		
2/5/2020	Lab 3 – Background traffic generation	Chapter 6	Lab report 2	02/12/20
2/10/2020	Attack traffic tools	Chapter 5		
2/12/2020	Lab 4 - Attack generation week 1	Chapter 5	Lab report 3	03/04/20
2/17/2020	Flooding attack traffic generation techniques and tools	Chapter 5		
2/19/2020	Lab 4 - Attack generation week 2	Chapter 14	Lab report 3	03/04/20
2/24/2020	In class test		Mid term	2/24/2020
2/26/2020	DDoS Amplification	Chapter 14		
3/2/2020	Lab 4 - Attack generation week 3		Lab report 3	3/4/2020
3/4/2020	Detection basics	Chapter 7		
3/9/2020	Attack detection lecture	Chapter 8		
3/11/2020	Lab 5 – Attack detection week 1	Chapter 7,8,14	Lab report 4	04/01/20
3/16/2020	Spring Break			
3/18/2020	Spring Break			
3/23/2020	Lab 5 – Attack detection week 2	Chapter 7,8,14	Lab report 4	04/01/20
3/25/2020	Traffic spoofing lecture	Chapter 9		
4/1/2019	Lab 6 – Deceiving DDoS Detection		Lab report 4	04/01/20
4/6/2020	Firewall/filtering lecture	Fu Yu Remote Lecture (To be confirmed)		
4/8/2020	Lab 7 – DDoS mitigation: week 1		Lab report 5	04/22/20
4/13/2020	Mitigation lecture	Chapter 10		
4/15/2020	Lab 7 – DDoS mitigation: week 2	Chapter 10, 14	Lab report 5	04/22/20
4/20/2020	Mitigation scaling			
4/22/2020	Lab 7 – DDoS mitigation: week 3		Lab report 5	04/22/20
4/27/2020	Final exam	7:00 to 9:30 PM	Final	Take home final due at 7:00 PM