ECE 8860: **Distributed Denial of Service**
Sections 1, 843,
Spring 2021

MEETING TIME: Monday and Wednesday 5:15 to 6:30 PM

MEETING LOCATION: Zoom link posted to IROAR

INSTRUCTOR(s):

R. R. Brooks
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OFFICE HOURS AND PROCEDURES:

Dr. Brooks, Office hours 4:00 to 5:00 PM on Monday. Online. Link shared on request.

Mr. Shao, TBD

COURSE MODALITY: Online

COURSE DESCRIPTION: 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.

 Coreq: None

COURSE PREREQUISITES: Instructor permission.

STUDENT LEARNING OUTCOMES: At the completion of the course the student will:

- o   Understand prevalent computer and network security issues,
- o   Implement DDoS mitigation strategies,
- o   Be able to configure network services,
- o   Understand Internet traffic patterns,, and
- o   Avoid network bottlenecks.

REQUIRED MATERIALS:

- o Distributed Denail of Service Attacks, by I. Ozcelik, andR. R. Brooks, CRC Press
- o Computer capable of running simultaneously at least 2 virtual machines,
- o Webcamera
- o Microphone
- o Internet connections
- o Cell phone

TOPICAL OUTLINE:

Date	Lecture topic	Reference	Assignment	Due
1/6/2021	SDN lecture and network topology	Chapters 6, 11, 14.1, 14.2, 14.3		
1/11/2021	Overview and syllabus	Chapter 1		
1/13/2021	Lab 1 – Traffic sniffing		Lab report 1	02/03/21
1/18/2021	MLK Day			
1/20/2021	History and Motivation of DDoS	Last day to drop Chapters 2 and 3		
1/25/2021	Importance of background traffic / DDoS legal discussion	Chapters 4 and 5		
1/27/2021	Lab 2 spoofing		Lab Report 1	02/03/21
2/1/2021	Botnet and IoT background	Chapters 2 and 3		
2/3/2021	Lab 3 – Background traffic generation	Chapter 6	Lab report 2	02/15/21
2/8/2021	Attack traffic tools	Chapter 5		
2/15/2021	Lab 4 - Attack generation week 1	Chapter 5	Lab report 3	03/03/21
2/17/2021	Flooding attack traffic generation techniques and tools	Chapter 5		
2/19/2020	Lab 4 - Attack generation week 2	Chapter 14	Lab report 3	03/03/21
2/22/2021	In class test		Mid term	2/22/2021
2/24/2021	DDoS Amplification	Chapter 14		
3/1/2021	Lab 4 - Attack generation week 3		Lab report 3	3/8/2021
3/3/2021	Detection basics	Chapter 7		
3/8/2021	Attack detection lecture	Chapter 8		
3/10/2021	Lab 5 – Attack detection week 1	Chapter 7,8,14	Lab report 4	03/31/21
3/15/2021	Spring Break			
3/17/2021	Spring Break			
3/22/2021	Lab 5 – Attack detection week 2	Chapter 7,8,14	Lab report 4	03/31/21
3/24/2020	Traffic spoofing lecture	Chapter 9		
3/29/2021	Lab 6 – Deceiving DDoS Detection		Lab report 4	03/31/21
3/31/2021	Firewall/filtering lecture	Fu Yu Remote Lecture (To be confirmed)		
4/5/2021	Lab 7 – DDoS mitigation: week 1		Lab report 5	04/26/21
4/7/2021	Mitigation lecture	Chapter 10		
4/12/2021	Lab 7 – DDoS mitigation: week 2	Chapter 10, 14	Lab report 5	04/26/21
4/14/2021	Mitigation scaling			
4/19/2021	Lab 7 – DDoS mitigation: week 3		Lab report 5	04/26/21
4/21/2021	Review			
4/26/2021	Final exam	7:00 to 9:30 PM	Final	Take home final due at 7:00 PM

CLASS CANCELLATION POLICY: Class will be canceled if instructor is more then 15 minutes late. Attempts will be made to inform students in advance of any calendar modifications.

GRADING POLICY:

Assignment	Due	Percent grade
Lab report 1	2/3/2021	10%
Lab report 2	2/15/2021	10%
Midterm	2/22/2021	20%
Lab report 3	3/3/2021	10%
Lab report 4	3/31/2021	10%
Lab report 5	4/26/2021	15%
Final	4/26/2021	25%
Total		100%

ATTENDANCE POLICY:

1. Lectures are online.
2. Online attendance is optional. Plans are to post videos of classes.
3. Assignments are due BEFORE class on the marked day. No late assignment will be accepted. No credit for late assignments.
4. If class is canceled on the day an assignment is due. Assignments can still be submitted. Students are responsible for guaranteeing that the assignment is in the instructor's inbox. Before class. If class is not possible on the finals day (unlikely), an alternative time will be arranged.
5. Notification of Absence in Canvas or email to inform the instructor of student absences is in general not needed. If a medical problem or accommodation issue results in a late assignment, this will be dealt with appropriately.
6. To maintain physical distancing, individuals arriving first to the classroom should sit farthest from the door. Similarly, at the conclusion of class, students closest to the door should leave first.
7. While on campus, face coverings are required in all buildings and classrooms. Face coverings are also required in outdoor spaces where physical distance cannot be guaranteed. If a student does not have a face covering or refuses to wear an approved face covering without valid documented accommodation, the instructor will ask the student to leave the academic space and may report the student's actions to the Office of Community & Ethical Standards as a violation of the Student Code of Conduct. If the student's actions disrupt the class to the extent that an immediate response is needed, the instructor may call the Clemson University Police Department at 656-2222.
8. Please note that the University may convert to a purely online mode at any time. University classes are initially in a purely online mode and will remain so until Sept. 21.

ACCESSIBILITY STATEMENT: 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 a class should let the instructor 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 or by emailing studentaccess@lists.clemson.edu. Students who receive Academic Access Letters are strongly encouraged to request, obtain, and present these to their instructors 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: http://www.clemson.edu/campus-life/campus-services/sds/.

TITLE IX STATEMENT: Clem[son 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.

SAFE CAMPUS: Clemson University is committed to providing a safe campus environment for students, faculty, staff, and visitors. As members of the community, we encourage you to take the following actions to be better prepared in case of an emergency:

a. Ensure you are signed up for emergency alerts (https://www.getrave.com/login/clemson)
b. Download the Rave Guardian app to your phone (https://www.clemson.edu/cusafety/cupd/rave-guardian/)
c. Learn what you can do to prepare yourself in the event of an active threat (http://www.clemson.edu/cusafety/EmergencyManagement/)

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*.

COPYRIGHT STATEMENT: Materials in this course are copyrighted. They are intended for use only by students registered and enrolled in this 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://clemson.libguides.com/copyright.

MODIFICATION STATEMENT: The instructor reserves the right to modify any aspect of the syllabus at any time during the semester for reasons including but not limited to COVID-related situations.