CS306: Introduction to IT Security

Fall 2020

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Instructor: **Nikos T**

September 1, 2020

STEVENS
INSTITUTE *of* TECHNOLOGY
THE INNOVATION UNIVERSITY®
1870

Today

◆ Course logistics

◆ Introduction to the field of IT security

   ◆ in-class discussion with a real-world example

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CS306: Topic of study

"Introduction to IT Security"

- ◆ "IT" = Information Technology
  - ◆ the study or use of information systems (especially computers, the Internet and telecommunication   ing information

- ◆ "IT security" = "com   ty"
  - ◆ the protection of information systems fr   age to the hardware, the software, and to the information on   from disruption or misdirection of the services they provide

- ◆ "Introduction to IT Security"
  - ◆ introductory course, broad topics w/ focus on basic tools & applications

CS306: Who can take it

- **Undergraduate** course

- Prerequisite course is **CS135** or **MA134** (i.e., discrete math)

- **Required** course for Cyber-security & Computer Science concentrations

  - in study plans of

- **Full-credit** course (w/ grade)

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PLEASE contact me any of the above does not apply to you

CS306: Lectures & labs

CS306 is offered in **2 required sessions**, each offered in **multiple sections**

◆ lectures

   ◆ CS306-A   Tue 2:00pm - 4:30pm   **Online**   67 / 69

   ◆ CS306-B   Tue 6:30pm - 9:00pm   **Online**   63 / 69

◆ labs

   ◆ CS306-Lx   Thursdays

x	A	B	C	D	E	F
time	8 - 8:50	9:30 - 10:20	11:00 - 11:50	12:30 - 13:20	2:00 - 2:50	3:30 - 4:20
enrollment	1	18	29	29	29	24

PLEASE contact me if you have not enrolled to any lab section

CS306: Lectures & labs (continued)

◆ Lecture/lab sections will cover the same materials

◆ Changes in lecture or lab sections

  ◆ **allowed** (if need be) but **generally discouraged** (for planning purposes)

◆ In any case, if a secti

  ◆ **students must let th** **ance**

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Disclaimer on lecture format

- Lectures take place in 2.5h slots

  - CS306-A   Tue 2:00pm - 4:30pm   **Online**   67 / 69

  - CS306-B   Tue 6:30pm - 9:00pm   **Online**   63 / 69

- Highly **problematic** ts & instructor

- Unfortunately **unav** ing restrictions

  - namely, finding two time slots that *allow* mores and CS seniors to *enroll*, without conflicting with other req s, is nearly impossible

  - let alone satisfying other Institute–wide policies and finding high-capacity rooms

> **Please provide suggestions on what can make class experience better despite 2.5h lectures**

CS306: Staff

- Instructor

  - **Nikos Triandopoulos**, ntriando@stevens.edu

  - course organization, management, lectures, assignments, grades, …

    - all mistakes will

  - office hours: Tuesd

  - office location: GS 428 – **not available in**

  - virtual office hours: Zoom ID 91463728672

- Teaching assistants

  - assistance w/ labs, assignments, "help sessions" as needed, some grading, demos

  - TAs & office hours: TBA

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CS306: Course organization – what is offered

◆ Weekly lectures

- ◆ materials covered via presentations, demos and whiteboard or in-class discussions
- ◆ two ~10 min breaks (on the 50min marks in the lecture)

◆ Weekly labs

- ◆ guided recitation o   aration of homework sets

◆ 3 - 4 homework sets

- ◆ revision and application of covered materials

◆ TA hours

◆ Office hours by instructor

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CS306: Learning materials

◆ Lectures

 ◆ lecture notes: slides in pdf available online after class

 ◆ additional materials covered via demos and whiteboard or in-class discussions

◆ Lab & homework as ~~Assignment Project Exam Help~~

 ◆ Canvas quizzes, practice code, online res

◆ Optional textbook

 ◆ *Security in Computing*, 5th edition,
  by Pfleeger, Pfleeger & Margulies, Prentice Hall

 ◆ available as hardcopy or e-book

CS306: Grading (tentative*)

- 20%   Participation (labs attendance & in-class quizzes)

- 40%   Homework assignments

- 40%   2 exams (midterm & final)

- 110%   Total (w/ extra cre

- Tentative* grading scheme

A	90-100
B	80-89
C	70-79

**PLEASE don't estimate your grade;
if you have concerns, just contact me!**

*Adapted as needed to fairly benefit the class

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CS306: Course workload – what is expected from you

◆ Attend online lectures regularly & participate

   ◆ e.g., you are expected to ask questions and provide comments

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◆ Attend labs

◆ Hand-in homework https://eduassistpro.github.io/

◆ Pass exams Add WeChat edu_assist_pro

on't underestimate this;

elf and your classmates!

◆ Work independently (unless otherwise explicitly specified)

   ◆ collaboration policy is governed by Honor System

◆ Provide feedback

CS306: Policies (not complete list)

- All class matters will be handled through Canvas

- Attendance of lectures & labs is required

  - only one missed lab is allowed

  - there are no make-

- Laptops

  - **required**

- Late assignments

  - 3 free late days, after which 10% per-day reduction

  - an exception may be granted by the instructor, if there is an important reason

CS306: Announcements

- Course materials will appear on Canvas
  - I'll make any effort to be complete, consistent and accurate in all updates
  - please be patient as I set up the processes and finalize course materials
  - communication (e.   ls, announcements, etc.)
- No lab session this
- TA hours & office hours will start next   nesday, September 9

CS306: Tentative Syllabus

Week	Date	Topics	Reading	Assignment
1	**Sep 1**	**Introduction**	**Lecture 1**	**-**
2	Sep 8	Symmetric-key crypto I		
3	Sep 15			
4	Sep 22			
5	Sep 29	Public-key cr		
6	Oct 6	Access control & authentication		
-	Oct 13	**No class (Monday schedule)**		
7	Oct 20	**Midterm**	All materials covered	

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CS306: Tentative Syllabus (continued)

Week	Date	Topics	Reading	Assignment
8	Oct 27	Software & Web security		
9	Nov 3	Network security		
10	Nov 10			
11	Nov 17			
12	Nov 24	Privacy		
13	Dec 1	Economics		
14	Dec 8	Legal & ethical issues		
15	Dec 10 (or later)	**Final** (closed "books")	All materials covered*	

* w/ focus on what covered after midterm

CS306: Course outcomes

◆ Terms

  ◆ describe common security terms and concepts

◆ Cryptography

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  ◆ state basics/fundamentals about secret and public key cryptography concepts

◆ Attack & Defense

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  ◆ acquire basic understanding for attack techni   mechanisms

◆ Impact

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  ◆ acquire an understanding for the broader impact of security and its integral connection to other fields in computer science (such as software engineering, databases, operating systems) as well as other disciplines including STEM, economics, and law

◆ Ethics

  ◆ acquire an understanding for ethical issues in cyber-security

Questions?

◆ Please ask questions during class!

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Today

- Course logistics

  - topic of study, enrollment eligibility, sessions

  - staff, learning materials, course organization

  - expectations, gradi

  - syllabus overview,

- Introduction to the field of IT security

  - in-class discussion with a real-world example

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re outsourced ion

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Another example: Tax return preparation…

Involves information collection & processing

- calculate financial data
    - payroll, profits, stock quotes, ...
- manage data
    - search emails, stor
- submit – done!

… by many
unknown machines!

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Data & computation outsourcing

Cloud-based services

- hardware, OS, software, apps, …

- storage, computation, databases, analytics, …

Transformative multi-pl

- businesses, organizations or individuals

- client-server, distributed, P2P, Web-based,

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*aaS

Internet protocols   **social networks**   **big-data analytics**   **sharing economy**   **FinTech**

Security consequences

Fact: Untrusted interactions

◆ information is processed outside one's administration control or "trust perimeter"

Risk: Falsified / leaked information

◆ information may unint   th unauthorized entities

Goal: Integrity / privac   sets

◆ need to protect information against change   thorized access

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What can go wrong?

Fact: Untrusted interactions

- information is processed outside one's administration control or "trust perimeter"

Risk: Falsified / leaked information

- information may unint   th unauthorized entities

Goal: Integrity / privac   sets

- need to protect information against change   thorized access

Threats:

- misconfigurations, erroneous failures, limited liability

- economic incentives of cost-cutting providers

- compromises, attacks, advanced persistent threats (APTs)

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Limited liability

"[We will] not be responsible for any damages arising in connection with any unauthorized access to, alteration of, or the deletion, destruction, damage loss or failure to store any of your content or other data."

A   ment

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Advanced Persistent Threats (APTs)

Sophisticated well-targeted cyber-attack campaigns

◆ aim for unauthorized data manipulation or exfiltration

◆ employ rich attack vectors & highly adaptive strategies

    ◆ social engineering

    ◆ zero-day vulnera

    ◆ low-and-slow progression

    ◆ intelligence

hard-to-defend
rd-to-detect

...
RSA   (2011)
Bit9   (2013)
Dyn   (2016)
Equifax (2017)
...

World's biggest data breaches

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"Information is beautiful"
by David McCandless
- world's biggest data breaches
  - losses > 30K records
  - up to 2/2/18

Real cases: Threats against integrity Vs. confidentiality
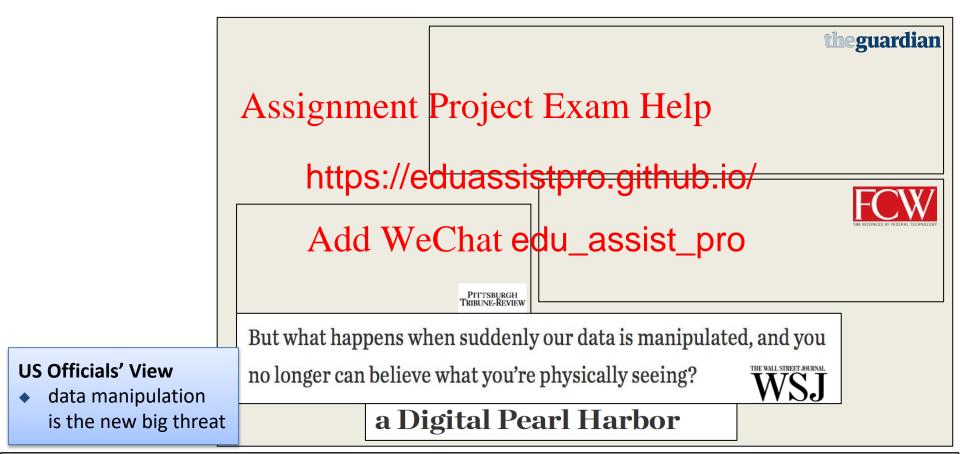
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Data Breach Investigations Report by Verizon (2013)
- ◆ servers are a high-value target
- ◆ compromises / attacks affect both confidentiality and integrity

The "new" big threat: Data manipulation

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But what happens when suddenly our data is manipulated, and you no longer can believe what you're physically seeing?

a Digital Pearl Harbor

US Officials' View
◆ data manipulation is the new big threat

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 ◆ syllabus overview,

◆ Introduction to the field of Security

 ◆ in-class discussion with a real-world example

 ◆ **coverage of basic concepts & terms**

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