Computer Science 161 Syllabus

UC Berkeley Department of Electrical Engineering and Computer Science

Course Title: Introduction to Computer Security

Units: 4 (See this page for how UC Berkeley units are computed.)

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Disclaimer

This PDF syllabus is provided for students who need a paper copy of the syllabus (e.g. exchange students who need a syllabus for their home university).

The most up-to-date content is on our course website: https://cs161.org.
In cases of dispute, the course website takes precedence.

Course Overview

Catalog Description: Introduction to computer security. Cryptography, including encryption, authentication, hash functions, cryptographic protocols, and applications. Operating system security, access control. Network security, firewalls, viruses, and worms. Software security, defensive programming, and language-based security. Case studies from real-world systems.

Course prerequisites: The prerequisites are recommended but not formally enforced.

- CS 61B (Data Structures)
- CS 61C (Machine Structures)
- CS 70 (Discrete Mathematics and Probability Theory)

Course restrictions: Course is not repeatable for credit.

Instruction Methods

Lecture: The course has 3 hours of lecture per week. See https://classes.berkeley.edu for the exact time/location. Lectures will be recorded and recordings will be posted. Lecture attendance is not taken.

Discussion sections: TAs teach weekly 1-hour discussion sections. See https://cs161.org for the times/locations. You can attend any discussion sections you want. Discussions are optional and discussion attendance is not taken.

Course Readings

Readings come from the course textbook, which is freely available online at https://textbook.cs161.org. The textbook is optional, and lectures are the main source of truth in cases of ambiguity.

Some other optional textbooks are *Introduction to Computer Security* by Goodrich & Tamassia and *The Craft of System Security* by Smith & Marchesini.

Grading

We will compute grades from a weighted average, as follows:

- Homeworks: 10% (equally weighted)
- Project 1: 10%
- Project 2: 20%
- Project 3: 10%
- Midterm: 20%
- Final: 30%

Grades are assigned according to these bins:

Course Points	Grade
[95,100]	A+
[85,95)	A
[80,85)	A-
[75,80)	B+
[70,75)	B
[65,70)	B-
[60,65)	C+
[55,60)	C
[50,55)	C-
[40,50)	D
[0,40)	F

Weekly Class Schedule

For exact dates for the current semester, see https://cs161.org.

Week	Lecture	Readings	Assignments
1	Introduction and Security Principles	Ch. 1	HW 1
	x86 Assembly and Call Stack	Ch. 2	
2	Memory Safety Vulnerabilities	Ch. 3	Project 1 Checkpoint
	Memory Safety Vulnerabilities 2	Ch. 3	
3	Mitigating Memory Safety Vulnerabilities	Ch. 4	HW 2
	Intro to Cryptography	Ch. 5	
4	One-Time Pads and Block Ciphers	Ch. 6	Project 1
	Block Cipher Modes of Operation	Ch. 6	
5	Cryptographic Hashes and MACs	Ch. 7 & 8	Project 2 Spec Quiz & HW 3
	PRNGs and Diffie-Hellman Key Exchange	Ch. 9 & 10	
6	Public-Key Encryption and Digital Signatures	Ch. 11 & 12	Project 2 Design Checkpoint
	Certificates, Passwords, and Case Studies	Ch. 13 & 14 & 15	
7	Introduction to Web	Ch. 18 & 19	HW 4
	Cookies and CSRF	Ch. 20 & 21	
8	XSS and UI Attacks	Ch. 22 & 23	Project 2 Testing Checkpoint
	SQL Injection and CAPTCHAs	Ch. 17 & 24	
9	Spring Break or Thanksgiving Break	N/A	
10	Intro to Networking	Ch. 25	HW 5
	Low-Level Network Attacks	Ch. 26 & 27 & 28	
11	BGP and Transport Layer (TCP, UDP)	Ch. 29 & 30	Project 2
	TLS	Ch. 31	
12	DNS	Ch. 32	HW 6
	DNSSEC	Ch. 33	
13	Denial of Service and Firewalls	Ch. 34 & 35	Project 3
	Intrusion Detection	Ch. 36	
14	Malware	Ch. 38	HW 7
	Anonymity and Tor	Ch. 39	

Descriptions of Assignments

Project 1: Exploit a series of vulnerable C programs on a virtual machine.
https://sp25.cs161.org/proj1/

Project 2: Design and implement a secure file sharing system.
https://sp25.cs161.org/proj2/

Project 3: Exploit a vulnerable web server.
https://sp25.cs161.org/proj3/

Homeworks: To view the homeworks, use the Gradescope join code here:
https://sp25.cs161.org/policies/#homeworks

Exams: There is a 2-hour midterm halfway through the semester, and a 3-hour final exam at the end of the semester. Both are paper exams.
To view past exams, see: https://sp25.cs161.org/resources/

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