Syllabus: CS1660, CS1620, CS2660

This is the official syllabus for CS1660, CS1620, and CS2660. Consult the course website at `https://cs.brown.edu/courses/csci1660/` for more details.

Course descriptions

CS1660 (Formerly CS166) This course teaches principles of computer security from an applied viewpoint and provides hands-on experience with security threats and countermeasures. The course additionally covers principles and skills useful for making informed security decisions and for understanding how security interacts with the world around it. The main topics covered are cryptography, authentication, access control, operating systems security, web security, and network security. Other topics include general security principles, human factors such as trust and social engineering, the security of complex systems, and the economics of security. The course aims to balance theory and practice.

CS1620 (Formerly CS162) This course is a half-credit lab intended to be taken concurrently with CS1660 and provides students with a deeper understanding of the material by doing advanced versions of the cS1660's projects. These advanced versions focus on real-world skills: performing attacks that are more difficult and rely on less serious vulnerabilities, performing attacks against systems with more real-world constraints, and creating attacks that achieve a higher standard of quality than a mere "proof of concept."

CS2660 This course teaches computer security principles from an applied viewpoint and provides hands-on experience with security threats and countermeasures. The course additionally covers principles and skills useful for making informed security decisions and for understanding how security interacts with the world around it. The main topics covered are cryptography, authentication, access control, web security, and network security. Other topics include cybersecurity ethics, and privacy. The course aims to balance theory and practice. These advanced versions focus on real-world skills: performing attacks that are more difficult and rely on less serious vulnerabilities, and creating attacks that achieve a higher standard of quality than a mere "proof of concept." This course is offered for graduate students only and covers the combination of CS1660 and CS1620.

Learning goals

In this course, students will learn principles of computer security, both from a theoretical and hands-on perspective. At the end of this course, students will be able to do the following:

- Understand and communicate about main security principles, both to a technical and non-technical audience

- Describe how security principles are used to improve the protection of modern systems and infrastructure

- Develop hands-on skills to both identify common security threats in complex systems and implement practical, effective countermeasure

- Critically discuss the ethical and social impact of security mechanisms, policies, and their enforcement, including how current and past examples have shaped modern views of security

Topics

Our course will broadly cover the following topics. For a detailed schedule, see our course website:
`https://cs.brown.edu/courses/csci1660/`

- Introductory cryptography techniques

- Authentication and authorization

- Web browser and web application security

- Operating system and cloud security

- Network and mobile security

- Technical aspects of social engineering

- Responsible computing and ethical implications of security techniques

Diversity and Inclusion

We intend for this course to provide a welcoming learning environment for all students. We especially welcome diverse ideas and perspectives during class discussions—after all, viewing systems in different ways often results in more robust and secure systems in the end.

Each year, the course staff examines all aspects of the course (content, assignments, and overall structure) to ensure the material is accessible and inclusive to all. However, despite our best efforts, we may accidentally slip up, so please feel free to speak to any member of the course staff with any concerns you have during the semester and do not hesitate to contact the instructor directly. In case you believe you need to escalate your concerns further, you can reach out to Professor Thomas Doeppner (Vice Chair and Director of Undergraduate Studies).

To access student support services and resources, and to learn more about diversity and inclusion in CS, please visit `https://cs.brown.edu/about/diversity/resources/`. This link also includes information on how to contact diversity advocates, even anonymously.

Prerequisites

CS1660   Students are expected to have taken one of (a) CS0160, CS0180, or CS0190; and one of (b) CS0300, CS0330, CS1310, or CS1330. Students who have previously taken CS1951E (a course no longer offered by the department) should not enroll in CS1660 given the significant overlap between CS1660 and CS1951E.

CS1620   Students enrolling in CS1620 must simultaneously enroll in CS1660.

CS2660   CS2660 is open to graduate students only. Students must have taken CS0300, CS0330, CS1310, or CS1330, or equivalent with permission of the instructors.

Learning Activities and Expected Workload

In-person lectures are held on Tuesdays and Thursdays from 1:00 PM–2:20 PM ET in person at CIT 368. All lectures will be recorded and posted online within a few hours. Students are encouraged to attend lecture in-person or synchronously via Zoom, though this is not required.

Coursework consists of 4 homeworks and 4 projects:

- **Homeworks** ask you and your peers to collectively and critically think about systems security questions that extend various topics covered in lecture. Through analyzing protocols, devising attacks, developing defenses, and considering ethical issues that are heavily tied to the material, the homeworks are designed to reinforce your skills in security analysis, discussing complex security topics

with your peers, and precise written communication of attacks and defenses. Throughout the course, there will be online virtual labs through TryHackMe which will provide hands-on opportunities to experiment within a safe, virtual machine environment inside a browser.

- **Projects** provide you with the opportunity to engage with real-world vulnerabilities in computer systems. They ask you to get down into the mud—hacking, scripting, breaking, and fixing— via a combination of developing exploits and designing countermeasures.

Lecture and assignment schedule   For the most up to date version of the lecture and assignment schedule, please the relevant page of our course website: `https://cs.brown.edu/courses/csci1660/`.

To get a sense of assignment content from a previous version of the course, you can view last year's course offering here: `https://cs.brown.edu/courses/csci1660/old/2023/`. However, note that while the assignment goals and structure will be similar, certain components and mechanics may differ for this version.

Expected workload

During the semester, students will spend about 3 hours per week in lecture (36 hours total), 9 hours per homework (36 hours total), and 15–35 hours per project (average 90 hours total). Additionally, combined preparation and active work time on the use of the practical virtual labs is expected to take 10 hours, for a total expected course workload of 180 hours.

CS1620   Coursework in CS1620 consists of doing advanced versions of the projects in CS1660 and additional questions on the written assignments (homeworks). The advanced components are designed to provide you with a greater appreciation of systems security and the "security mindset" as a whole by performing attacks against systems with more real-world constraints, and creating attacks that achieve a higher standard of quality than a mere proof of concept. There is no scheduled meeting time for CS1620.

For CS1620, the advanced components add about 70 hours of project material, 20 hours of homework material, for a total expected half-credit course workload of 90 hours.

CS2660   CS2660 combines the coursework components from both CS1660 and CS2660, and their associated workloads: ie, 180 hours total for CS1660 and 90 hours for CS1620.

Remote sections   Remote students may also enroll in this course remotely by registering for the remote section listed for their preferred course number. Our course is designed to provide a similar level of instruction and feedback for remote and in-person students, specifically:

- **Lectures**: Remote students are encouraged to attend lectures synchronously, but this is not required. All lectures will be recorded and posted after the lecture.

- **Office hours**: Throughout the semester, we will offer regular, remote-accessible office hours via Zoom. We will survey students when the semester begins to ensure that everyone can attend some of the slots—details will be released in the first two weeks of classes. In exceptional cases, the course staff is also able to set up meetings by appointment, subject to availability.

- **Edstem, Assignment feedback**: Both remote and in-person students are encouraged to ask questions on any course material via our course discussion board, EdStem. Our course staff makes an effort to respond in a timely manner, usually within 24 hours. In addition, all students will receive written feedback on assignments and projects throughout the semester (submitted and reviewed online via Gradescope).

Materials

Students do not need to purchase any additional materials to participate in the course. Developing for assignments will require use of any personal computer or CS department systems. Students who need a personal computer during the semester may request a "loaner" system through Brown's IT Service Center: `https://ithelp.brown.edu/kb/articles/it-service-center-loaner-equipment-3`

Optional textbook   This course is based on the textbook *Introduction to Computer Security* by Michael T. Goodrich and Roberto Tamassia, 1st Edition, ISBN: 9780321512949. The lecture schedule includes supplementary readings from the textbook, which is available in the Brown University Library. Students are not required to purchase this textbook to participate in the course.

Grading

Final numerical grades are determined using the weights below:

Assignments	Weighting
Homeworks	35%
Project 1	15%
Project 2	15%
Project 3	15%
Project 4	20%

All homeworks (with the exception of Homework 0, which does not count towards the final grade) are equally weighted.

If a student drops from CS1620 to CS1660-only, any CS1620 components that were completed will no longer count towards the final grade (with the exception of some assignments where the CS1620 requirements overlap with optional extra credit tasks for cs1660 students—in these cases, extra credit for such work will be given). Students taking CS2660 may not drop from CS2660 to CS1660 once course registration has ended (ie, after the normal shopping period).

The default thresholds for letter grades are A = 90, B = 80, and C/S = 70. Depending on the overall performance of the class, the thresholds may be adjusted downwards (but never upwards). Students taking both CS1660 and CS1620 will receive the same letter grade in both courses.

TopHat

At each class meeting there will be one or more questions to which students can respond using their smartphone or laptop. The course uses TopHat to facilitate this—see `https://ithelp.brown.edu/kb/articles/top-hat-student-guide` for instructions on setting this up. *TopHat answers will not factor into your numerical grade*, though we encourage students to use them as a way to engage with the lecture material.

Late Policy

Homeworks and Projects   Students are given *five* late passes to use on Homeworks 1 through 4 and Projects 1 through 4, though no more than *two* late passes may be applied to any deadline. Each late pass extends the deadline by 24 hours.

If you have no more late passes, every 24 hours a project or homework is submitted late will subtract 20% from that assignment's grade. Since we need to start grading assignments quickly in order to provide feedback, submissions more than two days late will not be graded without an excused extension.

There are some special cases to the late policy:

- Weekends and University holidays do not count against days late. Therefore, a submission due on Friday at 11:59pm is one day late if submitted any time before Monday at 11:59pm. If Monday were a University holiday, the submission would be one day late if submitted by Tuesday at 11:59pm.

- Project 4 is a partner project that contains multiple deadlines. Late passes may not be applied to the intermediate deadlines of Project 4. On the final deadline, your group will be allowed to use the *minimum* of you and your partner's remaining late days (up to the two late pass allowed on a project deadline, stated earlier).

Late passes and penalties are automatically applied at the end of the semester in an optimal fashion; that is, we will apply late passes in such a way that gives you the highest grade.

CS1620 and CS2660 students receive two additional late passes (*seven* total). However, students who drop CS1620 lose the additional passes and receive late penalties under the default CS1660 policy.

Extenuating Circumstances   If there are extenuating circumstances preventing you from completing an assignment on time, such as a sudden illness or other emergency. In these situations, please contact the instructors as soon as it is feasible for you to do so. A form will be provided for this process to ensure that we collect the appropriate information and can track any requests for extensions.

Please note that only the instructors are authorized to grant extensions. For privacy reasons, you should not contact the Head TAs or UTAs regarding extensions.

Often, extenuating circumstances arise because students are facing some adverse situation, sometimes an emergency. Follow the principle of "forgiveness, not permission". That is, if you are in a crisis, focus on your needs. (If you have a moment to drop us a note telling us you will be delayed, that's helpful, but in an emergency, don't worry.) You can submit your note later (though please try to do so within two days of the deadline so we know to expect a submission from you). However, you will eventually need to submit official documentation (such as a Dean's Note) for us to retroactively approve your extension request.

Collaboration Policy

All Brown students are responsible for understanding and following the *Brown Academic Code* and the *Code of Student Conduct*. Additionally, students are responsible for following the course *Collaboration Policy*—the official policy is posted on the course website.

In many places, the *Collaboration Policy* is purposely relaxed and encourages collaboration because we have found that working with others (in those specific places) is extremely beneficial to learning and the general camaraderie of the department. Outside of this, we use a variety of automated tools, as well as manual and statistical checks, to detect violations of the collaboration policy. Any flagged cases are investigated by hand by the instructor, and, when needed, are referred to the *Academic Code Committee* for further review.

Capstone and 2000-Level Credit

Capstone   CS1660 can be used as a capstone course for senior undergraduates. Students wishing to take CS1660 for capstone credit *must* take CS1620, and should register for both CS1660 and CS1620 in Banner. If you are planning on using CS1660 as your capstone course, please email the instructors. Students in the concurrent master's program who want 2000-level credit may enroll in CS2660 instead, which can also satisfy the capstone requirement.

2000-Level Credit   Graduate students who wish to obtain 2000-level credit for this course must enroll in CS2660.

Accessibility

Brown University is committed to full inclusion of all students. Students who, by nature of a documented disability, require academic accommodations should contact the professor. The staff of the office of *Student Accessibility Services* can be reached at 401–863–9588 or `SEAS@brown.edu` to request accommodations.

Additionally, the departmental *Health and Wellness Advocates* are available as a resource for you to discuss any concerns and to help you find options and accomodations.

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