Overview and Learning Goals

**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.

**CS162** This course is a half-credit lab intended to be taken concurrently with CS166 and provides students with a deeper understanding of the material by doing advanced versions of the CS166’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.”

Topics


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 Roberto directly. We will take your concerns very seriously. And in case you believe you need to escalate your concerns further, you can reach out to Professor Tom 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/](https://cs.brown.edu/about/diversity/resources/) and feel free to contact Laura Dobler, who coordinates diversity and inclusion initiatives in the department.
Learning Activities and Expected Workload

CS166  Coursework consists of homeworks, projects, and take-home midterms. Homeworks ask you and your peers to collectively and critically think about systems security questions in the context of topics covered in lecture. Projects ask you to get down into the mud—hacking, scripting, breaking, and fixing—and provide you with the opportunity to engage with real-world vulnerabilities, exploits, and design approaches in preparation for working with real-world systems. Finally, midterms distill the systems security knowledge from the semester to encourage you to identify and apply the “big ideas” in systems security that we’ll see throughout the course.

Lectures are held on Tuesdays and Thursdays from 1:00 PM–2:00 PM in CIT 368. Attending lectures and active class participation is highly encouraged. While we post lecture slides on the website, they are not a full transcript of the lectures. Also, class participation will help the instructor better assess your understanding of the topics in the determination of the final grade.

During the semester, students will spend about 3 hours per week in lecture (36 hours total), 8 hours per homework (48 hours total), and 15–25 hours per project (80 hours total). Additionally, the take-home midterms are each expected to take 3 hours to complete with an estimated 5 hours of preparation for each (16 hours), for a total expected course workload of 180 hours.

CS162  Coursework consists of doing advanced versions of the CS166 projects.

There is no scheduled meeting time for CS162. However, the course staff hosts sections throughout the semester that directly cover information relevant to the projects and their advanced components. We strongly encourage all CS162 students to attend these to maximize their learning throughout the course.

During the semester, the advanced components add about 20 hours of work to each project (80 hours total). Students are also asked to attend weekly hour-long sections related to the projects (10 hours total) for a total expected course workload of 90 hours.

Grading

Final numerical grades are determined using the weights below, which differ depending on whether or not a student is also enrolled in CS162:

<table>
<thead>
<tr>
<th>Assignments</th>
<th>CS166 Only</th>
<th>CS166 &amp; CS162</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written</td>
<td>52%</td>
<td>47%</td>
</tr>
<tr>
<td>· Homeworks</td>
<td>30%</td>
<td>25%</td>
</tr>
<tr>
<td>· Midterm 1</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>· Midterm 2</td>
<td>12%</td>
<td>12%</td>
</tr>
<tr>
<td>Technical</td>
<td>48%</td>
<td>53%</td>
</tr>
<tr>
<td>· Project 1</td>
<td>11%</td>
<td>12%</td>
</tr>
<tr>
<td>· Project 2</td>
<td>11%</td>
<td>12%</td>
</tr>
<tr>
<td>· Project 3</td>
<td>11%</td>
<td>12%</td>
</tr>
<tr>
<td>· Project 4</td>
<td>15%</td>
<td>17%</td>
</tr>
</tbody>
</table>

We drop the lowest homework grade when calculating the Homeworks portion of the grade and equally weigh the remaining homeworks.

The instructor determines overall letter grades by taking into account the final numerical grade and class participation. Students taking both CS166 and CS162 will receive the same letter grade in both courses.

Prerequisites

CS166  Students are expected to have taken (1) CS016, CS018, or CS019; and (2) CS033. Students who have previously taken CS1951-E (a course no longer offered by the department) should not enroll in CS166 given the significant overlap between CS166 and CS1951-E.

CS162  Students enrolling in CS162 must simultaneously enroll in CS166.
Textbook


Additional Resources

Announcements, lecture slides, additional reading materials, assignments, office hours, and other course information will be posted on the course website, https://cs.brown.edu/courses/cs166/. We will use Piazza for questions and answers about course topics and assignments.

Staff

Roberto Tamassia (Instructor)
Lilika Markatou (Grad TA)
Olivia Langley (Head TA)
Zachary Espiritu (Head TA)
Andy Donzelli (TA)
Hannah Chow (TA/Ethics TA)
Mariya Gedrich (TA)
Milla Shin (TA)
Nisha Khater (TA)
Shawna Huang (TA/Ethics TA)
William Schor (TA)

TopHat

At each class meeting there will be one or more questions to which students can respond to 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 directly factor into your numerical grade, though we encourage students to use them as a way to engage with the lecture material in more depth and the professor may take TopHat participation into account in regards to class participation.

Late Policy

Written  Late homeworks or midterms will not be accepted.

Technical  Students are given four late day passes to use on Projects 1 through 3, though no more than three late passes may be applied to any deadline. Each day a project is submitted late past that limit (or if you have no more late passes) subtracts 25% from that project’s grade. Late passes 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.

CS162 students receive two additional late passes (six total). However, students who drop CS162 lose the additional passes and receive late penalties under the default CS166 policy.

No late days can be used for the final project or its intermediate deadlines.

Extenuating Circumstances  If there are extenuating circumstances preventing you from completing an assignment on time (e.g., illness), please contact the instructor before the assignment is due. We will provide a form to contact the instructor regarding such circumstances and request special arrangements.
Collaboration Policy

The following table summarizes the CS166 and CS162 collaboration policy—for more details, please see the Collaboration Policy document posted on the course website.

<table>
<thead>
<tr>
<th></th>
<th>CS166/162 Staff</th>
<th>CS166/162 Students</th>
<th>Outside Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homeworks</td>
<td>May discuss any aspect.</td>
<td>May discuss any aspect. However, you must write up your final solution independently.</td>
<td>May consult if cited. Analysis must be your own.</td>
</tr>
<tr>
<td>Projects</td>
<td>May discuss any aspect.</td>
<td>May consult only for narrow questions about systems, languages, or frameworks involved as long as it does not help with the problem-solving process.</td>
<td>May consult outside sources to look up technical information about the languages, frameworks, or systems involved, but not about specific attacks.</td>
</tr>
<tr>
<td>Midterms</td>
<td>May discuss any aspect, though help may be limited.</td>
<td>May not consult.</td>
<td>May not consult.</td>
</tr>
<tr>
<td>Lecture Content</td>
<td>May discuss any aspect.</td>
<td>May discuss any aspect.</td>
<td>May consult outside sources and discuss with others.</td>
</tr>
</tbody>
</table>

Capstone and 2000-Level Credit

**Capstone** CS166 can be used as a capstone course. Students wishing to take CS166 for capstone credit must take CS162, and should register for both CS166 and CS162 in Banner. If you are planning on using CS166 as your capstone course, please email the Head TA list.

**2000-Level Credit** CS166 and CS162 can be taken together by master’s students for 2000-level credit. Students wishing to do this should only register for CS166 (not CS162) in Banner, and should email the Head TA list.

Student Responsibilities

All Brown students are responsible for understanding and following the Brown Academic Code and the Principles of the Brown University Community. Also, students taking 166/162 must understand and agree to follow the course collaboration policy, which is available on the course website.

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 and Employee Accessibility Services can be reached at 401-863-9588 or SEAS@brown.edu to discuss the process for requesting accommodations.