CS 478/579 – Syllabus

Credits: 4
Instructor Name: Scott Kerlin
Instructor Email: kerlins@oregonstate.edu
Teaching Assistants Name and Contact Info: Jonathon Keller - kellerjo@oregonstate.edu and Eunjin Roh - rohe@oregonstate.edu

Course Description
Basic concepts and techniques in network security, risks and vulnerabilities, applied cryptography and various network security protocols. Coverage of high-level concepts such as authentication, confidentiality, integrity, and availability applied to networking systems. Fundamental techniques including authentication protocols, group key establishment and management, trusted intermediaries, public key infrastructures, SSL/TLS, IPSec, firewalls and intrusion detection.

Prerequisites or Corequisites
CS 372 / ECE 372: With C or better
Recommended: CS 370

Instructor Communication
Please post all course-related questions in the ED Discussion Forum so that the whole class may benefit from our conversation. Please contact me privately via OSU Email for matters of a personal nature. You can expect a reply to your questions within 48 hours on business days (Monday-Friday). Grading and providing feedback on your assignments and activities may take up to 1 week. If I need more time, I will let you know when to expect a response. Feel free to send me Teams Direct Messages (DMs) as for private/personal matters. I try to respond to Teams DMs within 1 business day. All office hours and 1-on-1 meetings will be held via Teams.

Expectations for Time and Participation
This course expects you to sign in weekly to engage in the material and with your classmates via the course discussions. Undergraduate students should be expecting to devote 12 hours a week to this course or 120 hours for the full term. Graduate students may find that they require additional time for their research project.

This course is asynchronous and somewhat flexible, but not self-paced. Our schedule of Course Content and the due dates that appear in Canvas provide guidelines for how you’ll interact and with what frequency. I recommend that you create your own workload schedule and set reminders for assignment due dates. Particularly, it helps to keep track of when your discussion replies are due!
Learning Resources
This course does not currently require and purchases from you, as long as you are able run Kali Linux on one your own devices (details will be in the first module of the course). We use freely available software and all other materials are available within Canvas.

Technical Assistance
If you experience any errors or problems while in your online course, contact 24/7 Canvas Support through the Help link within Canvas. If you experience computer difficulties, need help downloading a browser or plug-in, or need assistance logging into a course, contact the IS Service Desk for assistance. You can call (541) 737-8787 or visit the Service Desk online.

Ecampus Reach Out for Success
University students encounter setbacks from time to time. If you encounter difficulties and need assistance, it’s important to reach out. Consider discussing the situation with an instructor or academic advisor. Learn about resources that assist with wellness and academic success; you can also access the Resources tab in Canvas’ global navigation menu for additional information.

Ecampus students are always encouraged to discuss issues that impact your academic success with the Ecampus Success Team. Email ecampus.success@oregonstate.edu to identify strategies and resources that can support you in your educational goals.

- For mental health:
  Learn about counseling and psychological resources for Ecampus students. If you are in immediate crisis, please call or text the Suicide and Crisis Lifeline at 988 or Crisis Text Line by texting 741-741.
- For financial hardship:
  Any student whose academic performance is impacted due to financial stress or the inability to afford groceries, housing, and other necessities for any reason is urged to contact the Director of Care for support (541-737-8748).

Measurable Student Learning Outcomes (MSLOs)
1. Select among packet capture strategies for specific situations
2. Analyze protocols to determine potential security weaknesses
3. Create protocol fuzzers to find potential vulnerabilities
4. Select appropriate defensive strategies based on goals

Refined Measurable Student Learning Outcomes and Their Mapping
1. Analyze and Construct a proper documentation for a specific network security scenarios [MSLO #4]
2. Articulate the ethical responsibility that a security engineer has [MSLO #4]
3. Utilize appropriate tools to attack and defend a network [MSLO #1, #2, #3]
4. Analyze protocols and services to determine potential security weaknesses within a specific network [MSLO #2]
5. Create software to find and exploit potential vulnerabilities within a specific network [MSLO #1, #2, #3]
6. Explain the limitations of different defensive and offensive strategies [MSLO #4]
7. Identify, Summarize, and Propose an idea related to current research trends related to penetration testing and vulnerability detection/exploitation [Graduate Outcome: Mapping depends on research topic but could be MSLO #1, #2, #3, or #4]

**Slash Course**
In addition to the regular course requirements, graduate students will also be working on a research proposal as part of this course.

**Evaluation of Student Performance**
- Discussions – 125 points x 8 = 1000 total discussion points
- Assignments – 100 points x 8 = 800 total assignment points
- Final Assignment – 200 points
- Graduate Research Assignment [Graduate Only] – 200 points
- Total – 2000 points for Undergraduates, 2200 points for Graduates.

**Letter Grade**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percent Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>93-100</td>
</tr>
<tr>
<td>A-</td>
<td>90-92.99</td>
</tr>
<tr>
<td>B+</td>
<td>87-89.99</td>
</tr>
<tr>
<td>B</td>
<td>83-86.99</td>
</tr>
<tr>
<td>B-</td>
<td>80-82.99</td>
</tr>
<tr>
<td>C+</td>
<td>77-79.99</td>
</tr>
<tr>
<td>C</td>
<td>73-76.99</td>
</tr>
<tr>
<td>C-</td>
<td>70-72.99</td>
</tr>
<tr>
<td>D+</td>
<td>67-69.99</td>
</tr>
<tr>
<td>D</td>
<td>63-66.99</td>
</tr>
<tr>
<td>D-</td>
<td>60-62.99</td>
</tr>
<tr>
<td>F</td>
<td>0-59.99</td>
</tr>
</tbody>
</table>
Course Policies

Discussion Participation
Students are expected to participate in all graded discussions. While there is great flexibility in online courses, this is not a self-paced course. You will need to participate in discussions each week. Your initial post is due at the week the discussion opens, and your replies are due the following week. This means that most weeks you will be making an initial post for the current module AND replying to your classmates in the previous module’s discussion.

Late Work Policy
Late work is not accepted. However, if you make an ON TIME submission, you receive an automatic 72 hour “Revision” extension. This extra 72 hours only applies if you made an ON TIME submission. So make sure you submit SOMETHING on time!

Incompletes
When a requirement of a course has not been completed for reasons acceptable to the instructor and the rest of the academic work is passing, a report of “I” (incomplete) may be made and additional time granted, according to Academic Regulation 17 of OSU Academic Regulations.

If you are having any difficulty that might prevent you completing the coursework, please don’t wait until the end of the term; let me know right away.

Statement Regarding Religious Accommodation
Oregon State University is required to provide reasonable accommodations for employee and student sincerely held religious beliefs. It is incumbent on the student making the request to make the faculty member aware of the request as soon as possible prior to the need for the accommodation. See the Religious Accommodation Process for Students.

Class Participation and Building Community
Active interaction with peers and your instructor is essential to everyone’s success in this online course. I encourage you to please practice the following:

- Value the diversity of the class. Recognize and respect the experiences, abilities, and knowledge each person brings to our learning environment.
- Challenge others’ ideas with the intent of facilitating growth. Acknowledge your peers’ contributions and highlight areas of further inquiry.
- Be open to being challenged on your ideas or prejudices.
- Practice self-awareness in your communication with peers and consider that your comments may hurt others unintentionally.
- Assume the best of your classmates and instructor and expect the best from them.

Expectations for Student Conduct
Student conduct is governed by the university’s policies, as explained in the Student Conduct Code (https://beav.es/codeofconduct). Students are expected to conduct themselves in the
course (e.g., on discussion boards, email postings) in compliance with the university's regulations regarding civility.

**Academic Integrity**
It is important that you understand what student actions are defined as academic misconduct at Oregon State University. The OSU Libraries offer a [tutorial on academic misconduct](https://library.oregonstate.edu/learning/academic-integrity), and you can also refer to the [OSU Student Code of Conduct](https://studentconduct.oregonstate.edu/policies) and the [Office of Student Conduct and Community Standards](https://studentconduct.oregonstate.edu) for more information. More importantly, if you are unsure if something will violate our academic integrity policy, ask your professors, GTAs, academic advisors, or academic integrity officers.

Academic misconduct, or violations of academic integrity, can fall into seven broad areas, including but not limited to: cheating; plagiarism; falsification; assisting; tampering; multiple submissions of work; and unauthorized recording and use.

**TurnItIn**
Your instructor may ask you to submit one or more of your writings to Turnitin, a plagiarism prevention service. Your assignment content will be checked for potential plagiarism against Internet sources, academic journal articles, and the papers of other OSU students, for common or borrowed content. Turnitin generates a report that highlights any potentially unoriginal text in your paper. The report may be submitted directly to your instructor or your instructor may elect to have you submit initial drafts through Turnitin, and you will receive the report allowing you the opportunity to make adjustments and ensure that all source material has been properly cited. Papers you submit through Turnitin for this or any class will be added to the OSU Turnitin database and may be checked against other OSU paper submissions. You will retain all rights to your written work. For further information, visit [Academic Integrity for Students: Turnitin – What is it?](https://library.oregonstate.edu/learning/academic-integrity/turnitin).

**Statement Regarding Students with Disabilities**
Accommodations for students with disabilities are determined and approved by Disability Access Services (DAS). If you, as a student, believe you are eligible for accommodations but have not obtained approval, please contact DAS immediately at 541-737-4098 or at [http://ds.oregonstate.edu](http://ds.oregonstate.edu). DAS notifies students and faculty members of approved academic accommodations and coordinates implementation of those accommodations. While not required, students and faculty members are encouraged to discuss details of the implementation of individual accommodations.

**Accessibility of Course Materials**
All materials used in this course should be accessible. If you encounter materials which are not accessible, please let the instructor know as soon as possible to rectify the situation. If you require accommodations please contact [Disability Access Services (DAS)](https://ds.oregonstate.edu).
Additionally, Canvas, the learning management system through which this course is offered, provides a vendor statement certifying how the platform is accessible to students with disabilities.

**Tutoring and Writing Assistance**
You can connect live with experienced online tutors by accessing TutorMe in the side navigation bar of your Canvas course. You are eligible for up to 5 hours of tutoring each week. To learn more, go to [Online Tutoring - Overview](https://registrar.oregonstate.edu/osu-academic-calendar).

To get help with any form of writing, you can contact [Oregon State Online Writing Support](https://asosu.oregonstate.edu/advocacy/rights) for feedback via email or live Zoom appointment.

**Academic Calendar**
All students are subject to the registration and refund deadlines as stated in the Academic Calendar: [https://registrar.oregonstate.edu/osu-academic-calendar](https://registrar.oregonstate.edu/osu-academic-calendar).

**Student Bill of Rights**
OSU has twelve established student rights. They include due process in all university disciplinary processes, an equal opportunity to learn, and grading in accordance with the course syllabus: [https://asosu.oregonstate.edu/advocacy/rights](https://asosu.oregonstate.edu/advocacy/rights).

**Student Learning Experience Survey**
During Fall, Winter, and Spring term the online Student Learning Experience surveys open to students the Wednesday of week 9 and close the Sunday before Finals Week. Students will receive notification, instructions, and the link through their ONID email. They may also log into the survey via MyOregonState or directly at [https://beav.es/Student-Learning-Survey](https://beav.es/Student-Learning-Survey). Survey results are extremely important and are used to help improve courses and the learning experience of future students. Responses are anonymous (unless a student chooses to “sign” their comments, agreeing to relinquish anonymity of written comments) and are not available to instructors until after grades have been posted. The results of scaled questions and signed comments go to both the instructor and their unit head/supervisor. Anonymous (unsigned) comments go to the instructor only.

**Course Content**

<table>
<thead>
<tr>
<th>Week/Module</th>
<th>Topic</th>
<th>Explorations and Learning Pages</th>
<th>Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Setup and Introduction</td>
<td>Ethical Hacking Pen-testing Scripting Review</td>
<td>Ethics Discussion Installing Kali and Writing a Script</td>
</tr>
<tr>
<td>2</td>
<td>Protocols and Reconnaissance</td>
<td>Main Protocols Review Scanning (4 parts)</td>
<td>Performing Your Own Reconnaissance</td>
</tr>
<tr>
<td>3</td>
<td>Packet Inspection and Scanning</td>
<td>Packet Decryption Packet Scanning Tcpdump Packet Capture</td>
<td>Ethical Board Decryption Basic Vulnerability Scanning Using Captured Packets</td>
</tr>
<tr>
<td>Week/Module</td>
<td>Topic</td>
<td>Explorations and Learning Pages</td>
<td>Assignments</td>
</tr>
<tr>
<td>-------------</td>
<td>-------</td>
<td>---------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Person In The Middle</td>
<td>Credential Stealing Session Hijacking Public/Private Keys and MFA</td>
<td>MFA Discussion Crafting a Solution to a Vulnerable Network</td>
</tr>
<tr>
<td>5</td>
<td>Bastions and Evading Them</td>
<td>Intrusion Deception Firewalls Intrusion Detection/Prevention</td>
<td>Remote Detonation Discussion Allow This, Deny That, Flag/Log This Other Thing</td>
</tr>
<tr>
<td>6</td>
<td>Attacking the Network</td>
<td>DB Poisoning and Other Routing Protocol Attacks Exploiting Demonstration</td>
<td>Trustworthy DB Protocol Discussion Routing Presentation Graduate Research Lit Review Due</td>
</tr>
<tr>
<td>7</td>
<td>Active Breaching</td>
<td>Protocol Fuzzing (D)DoS</td>
<td>Identifying and Evaluating Different (D)DoS Defenses Fuzz It! DoS It!</td>
</tr>
<tr>
<td>8</td>
<td>Snoop Proofing</td>
<td>VPNs Onion Routing</td>
<td>Proposing and Evaluating a VPN/NAT Setup Discussion Identify the Traffic</td>
</tr>
<tr>
<td>9</td>
<td>Beyond the Breach</td>
<td>Looking for Beaconing Covert Channels</td>
<td>Beyond the Breach Discussion</td>
</tr>
<tr>
<td>10</td>
<td>Final Missions</td>
<td>N/A</td>
<td>Final Assignment</td>
</tr>
<tr>
<td>Finals</td>
<td>Finals Week</td>
<td>N/A</td>
<td>Final Assignment Due Graduate Research Assignment Due</td>
</tr>
</tbody>
</table>