CS467/567– Reverse Software Engineering, Fall 25'

[Prof. Rui Ning](), [Old Dominion University]()

Course Description

The object of Software Reverse Engineering is to provide students with the understanding and practice to perform analysis on malware, deduce their functionality, and determine how malware works, and to aid the analysis via disassembly. Students will be able to use tools (IDAPro, Ollydbg) to safely perform static and dynamic analysis of malware, including encoded, packed, and obfuscated ones.

Each course session will be split into **two sections: lecture and TA-assisted in-class homework**. The course will feature **extensive hands-on labs/assignments** on each knowledge unit, and we will include a small portion of **AI tools and content** to help with reverse engineering.

Goals:

- Understand the mechanisms of common malicious programs (viruses, worms, trojans, backdoors, rootkits).
- Apply reverse engineering methodologies to explore executable machine code.
- Identify vulnerabilities exploited by malware.
- Recognize techniques used by malware to evade detection.
- Evaluate countermeasures and understand how malware disables them.
- Demonstrate awareness of the ethical responsibilities in software analysis and cybersecurity.

Prerequisites: Proficiency in x86 Windows assembly language, software systems, and computer networks.

Questions and Homework Assistance

For questions and help with homework assignments, please send emails to our Teaching Assistants and copy me on all correspondence. Our TAs are Junrui Zhang ([jzhan008@odu.edu]()) and Miao Lin ([mlin020@odu.edu]()). Please be sure to CC me at [rning@odu.edu]() on all homework-related emails to ensure proper coordination and timely responses to your inquiries.

Instructor

[Prof. Rui Ning]()
Office hours: Wed 6-7 pm on Zoom

Time and Location

Lectures: Monarch Hall, 1113B

Online Streaming Available by Request
Monday, 7:25 - 10:05 pm

Students must have a computer or laptop to complete the homework. Please note that Mac M series computers (M1, M2, M3, etc.) are not compatible with our virtual machine environment and cannot be used for this course.

Two options:

- **Use computer at home and stream through the online session**
  https://odu.zoom.us/my/rui.ning
- **Bring own laptop to class**

Grading

In-class Homework	30%
Homework	40 %
Final Project	30 %

Do not install/click malware PE files on desktop - only in the VM

VM Image Link (Load .ova into VirtualBox)

1. Download this Image to your Desktop:
   https://drive.google.com/file/d/1dU0kTgiWjBPR2E3MY_8bAGiSLBnRLbhW/view?usp=sharing

2. Use Virtual Box to Import Image
3. Image has been fully configured and loaded with all the tools we need in this class

Textbook

Uploaded in Canvas

Available at:

Books/Practical_Malware_Analysis.pdf at master · barondante/Books

Homework Submission

In-Class Homework Due Every **Thursday Midnight**

Homework Due Every **Sunday Midnight**

Please submit all homework to Canvas

Tentative Schedules

Week	Topics	In-Class Homework	Homework
1	Introduction; Basic Static Techniques (Ch. 1)	In-Class HW 1	Lab 1-2, Lab 1-3
2	Labor Day (No Class)	–	–
3	Basic Dynamic Analysis I & II	In-Class HW 3	HW 3
4	x86 Assembly; IDA Pro	In-Class HW 4	HW 4
5	Code Constructs (Ch. 6); Malicious Windows Programs (Ch. 7)	In-Class HW 5	HW 5
6	Debugging (Ch. 8); OllyDbg (Ch. 9)	In-Class HW 6	HW 6
7	Malware Behavior (Ch. 11); Covert Launching (Ch. 12)	In-Class HW 7	HW 7
8	Data Encoding (Ch. 13); Network Signatures (Ch. 14)	In-Class HW 8	HW 8
9	Anti-Disassembly (Ch. 15); Anti-Debugging (Ch. 16)	In-Class HW 9	HW 9
10	Anti-Disassembly (continued)	In-Class HW 10	HW 10
11	Anti-Debugging (Ch. 16); Anti-VM Techniques (Ch. 17)	In-Class HW 11	Project work
12	Packers & Unpacking (Ch. 18); Shellcode Analysis (Ch. 19)	In-Class HW 12	Project work
13	C Analysis (Ch. 20)	In-Class HW 13	Project work
14	64-bit Malware (Ch. 21); Buffer Overflow	In-Class HW 14	Project work
15	Project Week (no class)	–	Final Project due (Dec. 11, 11:59 pm)

Grading Scale

Letter grades are based on the following percentage scale:

Percentage	Letter Grade
100-92	A
87-91	A-
83-86	B+
79-82	B
75-78	B-
72-74	C+
69-71	C
66-68	C-
63-65	D+
60-62	D
<60	F

Policy on Incomplete Grades

A grade of "I" indicates assigned work yet to be completed in a given course, or absence from the final examination, and is assigned only upon instructor approval of a student request. The "I" grade may be awarded only in exceptional circumstances beyond the student's control. The "I" grade becomes an "F" if not removed by the day grades are due for following term based on specific criteria: [Incomplete, Withdraws and Z grades](#).

Expectations

What you can expect from me, as your instructor:

- I will ensure the accuracy of the course content.
- I will provide clear guidelines on the course assignments.
- I will be available to answer your questions.
- I will provide meaningful feedback in a timely manner.
- I will do my best to create a worthwhile learning experience for all of my students.
- I will follow fair and clear evaluation guidelines for all the course assignments.
- I will do my best to prepare you for exams and assignments.

What I expect from you, as my student:

- You will complete all course readings and assignments in a timely manner.
- You will follow the ODU honor pledge.
- You will follow proper netiquette.
- You will interact with your faculty and classmates professionally and respectfully.
- You will avoid sarcasm and inappropriate language, including the use of ALL CAPS.
- You will acknowledge your classmates' ideas and build on them to contribute to the discussion.

Course Policies

Attendance and Participation

Regular attendance and active participation are essential to succeed in this course. Students are expected to attend all scheduled classes, participate in discussions, and engage in group activities. Absences may affect your participation grade unless previously excused or due to exceptional circumstances. If you are unable to attend a class, please notify the instructor in advance when possible, and be sure to review the missed content.

Late Assignments

Assignments are due on the specified date and time, as late submissions disrupt the course flow and feedback process. However, understanding that emergencies and unforeseen events can arise, you may submit an assignment up to 48 hours late with a 10% penalty per day. Beyond this period, late submissions will not be accepted unless previously arranged under exceptional circumstances, such as documented illness or family emergency. Students should reach out promptly if an extension is needed. Make-up assignments are provided only for documented absences.

Assignment Feedback

Students can expect feedback on their assignments within three weeks of submission. Feedback will be provided through Canvas and may include written comments, evaluations, and suggestions for improvement. For major assignments, more detailed feedback will be provided to help guide your learning and development in the course. If you have questions about your feedback or would like to discuss it further, please schedule a meeting during office hours or email the instructor to arrange a time to meet.

Course Disclaimer

The course schedule and activities are subject to change. Changes will be posted as Announcements in Canvas.

University Policies

Code of Student Conduct and Academic Integrity

The Office of Student Conduct & Academic Integrity (OSCAI) oversees the administration of the student conduct system, as outlined in the Code of Student Conduct. Old Dominion University is committed to fostering an environment that is: safe and secure, inclusive, and conducive to academic integrity, student engagement, and student success. The University expects students and student organizations/groups to uphold and abide by standards included in the Code of Student Conduct. These standards are embodied within a set of core values that include personal and academic integrity, fairness, respect, community, and responsibility.

Honor Pledge

By attending Old Dominion University, you have accepted the responsibility to abide by the Honor Pledge:

I pledge to support the Honor System of Old Dominion University. I will refrain from any form of academic dishonesty or deception, such as cheating or plagiarism. I am aware that as a member of the academic community it is my responsibility to turn in all suspected violations of the Honor Code. I will report to a hearing if summoned.

Discrimination Policy

The purpose of this policy is to establish uniform guidelines in order to promote a work and education environment that is free from harassment and discrimination, as defined below, and to affirm the University's commitment to foster an environment that emphasizes the dignity and worth of every member of the Old Dominion University community. The Discrimination Policy details the process to address complaints or reports of retaliation, as defined by this policy.

Diversity and Inclusion

The Division of Student Engagement & Enrollment Services values the uniqueness of our Monarch community. The word "engagement" reflects our commitment to embrace the differences in our cultural backgrounds, perceptions, beliefs, traditions, world views, socio-economic status, cognitive and physical abilities.

We will strive to serve as the pre-eminent model for engaging every student to achieve their own success. Our core values are fueled by our responsibility and actions toward community development and engagement, cultural competence and understanding, physical and mental wellness and inclusion for every member of ODU. We will embrace our greatest strength - the diverse composition of our student body and workforce. For more information regarding diversity and inclusion, please visit the Office of Intercultural Relations.

Educational Accessibility and Accommodations

Old Dominion University is committed to ensuring equal access to all qualified students with disabilities in accordance with the Americans with Disabilities Act. The Office of Educational Accessibility (OEA) is the campus office that works with students who have disabilities to provide and/or arrange reasonable accommodations.

The Accommodations for Students with Disabilities define the procedures used to accommodate student with disabilities. Students are encouraged to self-disclose disabilities that the Office of Educational Accessibility has verified by providing Accommodation Letters to their instructors early in the semester in order to start receiving accommodations. Accommodations will not be made until the Accommodation Letters are provided to instructors each semester

University Email Policy

With the increasing reliance and acceptance of electronic communication, email is considered an official means for University communication. Old Dominion University provides each student an email account for the purposes of teaching and learning, research, administration, and service. It is the responsibility of every eligible student to activate MIDAS, the Monarch Identification and Authorization System, in order to obtain email access. It is important that all students are aware of the expectations associated with email use as outlined in the Student Email Standard. The email account provided by the University is considered to be an official point of contact for correspondence. Students are expected to check their official e-mail account on a frequent and consistent basis in order to stay current with University communications. Mail sent to the ODU email address may include notification of University-related actions, including academic, financial, and disciplinary actions. For more information about student email, please visit Student Computing.

Withdrawal

A syllabus constitutes an agreement between the student and the course instructor about course requirements. Participation in this course indicates your acceptance of its teaching focus, requirements, and policies. Please review the syllabus and the course requirements as soon as possible. If you believe that the nature of this course does not meet your interests, needs or expectations, if you are not prepared for the amount of work involved – or if you anticipate assignment deadlines or abiding by the course policies will constitute an unacceptable hardship for you – you should drop the course by the drop/add deadline, which is listed in the ODU Schedule of Classes. For more information, please visit the Office of the University Registrar.

Privacy of Student Information

Old Dominion University recognizes its duty to uphold the public's trust and confidence, not only in following laws and regulations, but in following high standards of ethical behavior. Members of the Old Dominion University community are responsible for maintaining the highest

ethical standards and principles of integrity. The [Code of Ethics](#) is a set of values-based statements that demonstrate the University's commitment to this goal. The [Privacy of Student Information](#) details Family Educational Rights & Privacy Act (FERPA), along with other information regarding privacy.