

CS 761/861 - Malware Analysis and Reverse Engineering

Course Information

- **Instructor(s):** Shuai Hao
- **Course title, number, section:** CS 761/861: Malware Analysis and Reverse Engineering
- **Semester and year:** Fall 2026
- **Delivery mode (synchronous or asynchronous online):** asynchronous

Course Description

Catalog Description

Theory and practice in analysis and mitigation of malware in networked machines. Theoretical topics include methods of attack anatomy, identification, reverse and anti-reverse engineering. Practice entails learning tools and techniques used by malware attackers, defenders, and analysts in lab-based projects conducted in a secure 'sandbox' mode.

Course Description

Theory and practice in analysis and mitigation of malware in networked machines. Theoretical topics include methods of attack anatomy, identification, reverse and anti-reverse engineering. Practice entails learning tools and techniques used by malware attackers, defenders, and analysts in lab-based projects conducted in a secure 'sandbox' mode.

Prerequisites

- C and C++ programming
- x86 architecture and assembly language course.

Required Materials

Required Textbook

- Practical Malware Analysis by Sikorski and Honig (ISBN: 978-1-59327-290-6)

Supplemental Materials (Optional)

- The Art of Memory Forensics by Ligh, Case, Levy and Walters (ISBN-10: 1118825098)

Technology Requirements

- Personal Laptop that enables running Virtual Machine Manager Software
- Software: Virtual Machine Manager (VirtualBox)

Course Learning Objectives

- CLO 1: Evaluate malware analysis requirements to select appropriate tools and methodologies for diverse threat scenarios.
- CLO 2: Execute malware samples within a secure, isolated sandbox environment to prevent host or network contamination.
- CLO 3: Analyze malicious code behavior through both static structural examination and dynamic runtime observation.
- CLO 4: Deconstruct compiled binaries using reverse-engineering techniques to reveal hidden functionality and intent.

Grading Criteria

In this course, I will calculate your final grade based on the following categories:

Assignments	Percentage/Points
Homework Assignments	700
Final Exam	300

Assignment Requirements

[Provide the main assignment categories (e.g., Quizzes, Written Assignments, Participation, Projects, Final Exam), indicate the weight or percentage each contributes to the final grade, and include a short description of what is expected for each category, learning objectives alignment, frequency, deliverables and evaluation criteria. Add any key notes about deadlines, late work policies, and how submissions should be made.]

Assignment Category: Homework Assignments – 70%

Purpose: [Insert a brief description of the objective of the assignment. *Example: The purpose of this assignment is to help students connect theoretical frameworks to practical applications in instructional design.*]

Course Learning Objectives: List the course learning objectives that align with this assignment. *Example: CLO2 – Apply key learning theories to instructional design; CLO4 – Analyze case studies using evidence-based practices.*]

Frequency: Identify when this assignment occurs. *Example: Appears in Modules 1–5, due weekly on Sundays by 11:59 p.m.*]

Instructions: Provide clear, step-by-step directions for completing the assignment. Include expectations for format, length, sources, and submission methods. *Example: Review the*

assigned readings, respond to the discussion prompt with a 250–300-word post, and reply to two peers.]

Deliverables: Specify what students will submit and how. *Example: Submit a written reflection (2–3 pages, double-spaced) as a Word or PDF file via Canvas Assignments.]*

Evaluation Criteria: List how the work will be assessed. Reference to any rubric or specific criteria. *Example: Evaluation will be based on accuracy, depth of analysis, organization, writing mechanics, and alignment with CLOs as outlined in the Discussion Rubric.]*

Assignment Category: Final Exam – 30%

Purpose: [Insert a brief description of the objective of the assignment. *Example: The purpose of this assignment is to help students connect theoretical frameworks to practical applications in instructional design.]*

Course Learning Objectives: List the course learning objectives that align with this assignment. *Example: CLO2 – Apply key learning theories to instructional design; CLO4 – Analyze case studies using evidence-based practices.]*

Frequency: Identify when this assignment occurs. *Example: Appears in Modules 1–5, due weekly on Sundays by 11:59 p.m.]*

Instructions: Provide clear, step-by-step directions for completing the assignment. Include expectations for format, length, sources, and submission methods. *Example: Review the assigned readings, respond to the discussion prompt with a 250–300-word post, and reply to two peers.]*

Deliverables: Specify what students will submit and how. *Example: Submit a written reflection (2–3 pages, double-spaced) as a Word or PDF file via Canvas Assignments.]*

Evaluation Criteria: List how the work will be assessed. Reference to any rubric or specific criteria. *Example: Evaluation will be based on accuracy, depth of analysis, organization, writing mechanics, and alignment with CLOs as outlined in the Discussion Rubric.]*

Grading Scale

Letter grades are based on the following percentage scale:

Percentage	Letter Grade
92 - 100	A
88 - 91	A-
84 - 87	B+

80 - 83	B
75 - 79	B-
70 - 74	C+
65 - 69	C
60 - 64	C-
Below 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 the following term, based on specific criteria: [Incomplete, Withdraws and Z grades](#).

Expectations (Optional)

What you can expect from me, as your instructor:

- I will ensure the accuracy of the course content.
- I will provide clear guidelines regarding 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 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

Since this is an online course, there is no mandatory attendance policy. However, students are expected to actively participate in homework submissions and journal writing. Each of these components is graded and counted toward the final grade.

Late Assignments

Any assignment submitted after its deadline is considered late. The following penalties for late assignments apply:

- 0-24 hours late: -10%
- 25-48 hours late: -20%
- Over 48 hours late not accepted, unless explicitly approved by the instructor

This time limit includes weekends -- they are counted just like weekdays.

Course Disclaimer

Every attempt is made to provide a syllabus that is complete and provides an accurate overview of the course. However, circumstances and events may make it necessary for the instructor to modify the syllabus during the semester. This may depend, in part, on the progress, needs, and experiences of the students.

AI Usage (Optional)

[Add your conditions for using AI in the course. For more details on different policies, visit the [Sample Course Policy Statements](#)

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 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, 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 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.

Course Schedule

[Describe the length of a week, module, or unit. *Example: Each module will begin on Tuesday at 12:01 a.m. and end on Monday at 11:59 p.m. All assignments are due by the end of each module unless otherwise noted.*]

Week/Module	Date	Topics	Assignments	Due Date
Module 1	Week 1	Course Introduction and Setup	Assignment 1	
Module 2	Week 2	Basic Static Analysis	Assignment 2	
Module 3	Week 3	Basic Dynamic Analysis	Assignment 3	
Module 4	Week 4	X86 Disassembly	Assignment 4	
Module 5	Week 5	Analyzing Windows Program	Assignment 5	
Module 6	Week 6	Debugging	Assignment 6	
Module 7	Week 7	Kernal Debugging and WinDbg	Assignment 7	
Module 8	Week 8	Final Exam		