# CYBE 467: Practicing Cybersecurity: Attacks & CountermeasuresSpring 2018 - Credit Hours: 3Method of Instruction: Lecture

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| **Instructor:** | **Dr. Yanfang (Fanny) Ye****Office:** AERB-255**Email:** yanfang.ye@mail.wvu.edu**Phone:** (304) 293-9128**URL:** <http://community.wvu.edu/~yaye/>  |
| **Class Meets:** | T/R 3:30-4:45pm |
| **Office Hours:** | F 2:30-4:30pm, or by appointment |

## Course Pre or Co Requisites:

CS 350, or consent of the instructor.

## Course Description:

Cybersecurity knowledge and practices on security risk management. Current security trends and industrial practices on cybersecurity. Experiments on ethical hacking and practice of cyber defense.

## Course Overview:

Cyberattack has been one of the most severe security threats to the world which becomes more networked and relies more on a complex but fragile cyberspace. To combat both immediate and growing cyberattacks, businesses and governments are spending billions of dollars on cybersecurity. This course equips students with cybersecurity knowledge and practices on security risk management. Through this course, students will understand existing cybersecurity issues, learn how to assess security risks, and conduct experiments on ethical hacking. They will practice system attack and defense strategies using security tools, so as to gain practical experience to become a cybersecurity professional. The course covers current security trends, industrial practices on cybersecurity, design requirements for secure web, software and mobile applications, security assessment, risk analysis and risk management.

## Expected Learning Outcomes:

Upon successful completion of this course, the student shall be able to:

* Describe a range of current problems and tensions in modern cybersecurity.
* Recognize the vulnerabilities and threats to cyber infrastructure and assess the security risks.
* Conduct reverse engineering and static/dynamic code analysis of malicious software.
* Apply typical techniques for malware detection.
* Conduct cybersecurity attack and defense strategies using security tools.
* Apply the principles of risk and conduct a risk management exercise.

## Course Resources:

No textbook is required. Course lectures, notes and other materials will be found under the course materials section on WVU eCampus system.

# Course Requirements

## Tentative Course Schedule:

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| **Week, Module, Unit Title** | **Start/End Date (Due Date)** | **Lectures & assigned Readings** | **Assignments & Assessments Due** |
| Module 1 | Week 1 | **T1: Introduction*** Course Introduction
* Introduction of Cybersecurity
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| Module 2 | Week 2-3 | **T2: Software Security: Attacks & Defenses*** Software Security Threats
* Memory Safety Vulnerabilities
* ***Practice:*** Buffer Overflows - Attacks and Defenses
 | HW1 Out  |
| Module 2 | Week 4-7 | **T3: Reverse Engineering and Malware Analysis*** Assemble Toolkit for Malware Forensics
* Static and Dynamic Code Analysis
* Advanced Malware Detection Techniques
* ***Practice:*** Malware Hacking and Defenses
 | HW2 Out HW3 Out |
| Module 3 | Week 8-9 | **T4: Mobile Security: Attacks & Defenses*** Understanding Android Security
* Mobile Defense Techniques
* ***Practice:*** Cracking of Android Applications
 | HW4 Out |
| Module 4 | Week 10-11 | **T5: Web Security: Attacks & Defenses*** Web Security Overview
* Web Application Hacking and Defenses
* ***Practice:*** Injection Attacks
 | HW5 Out |
| Module 5 | Week 12-13 | **T6: Network Security: Attacks & Defenses*** Network Security Overview
* Network Hacking and Secure Design
* ***Practice:*** DNS Info Searching and Vulnerability Scanning
 | HW6 Out  |
| Module 6 | Week 14 | **T7: Advanced Topics in Cybersecurity** |  |
| Module 7 | Week 15 | **Group Project Presentation** | Group project report submission |

## Evaluation/Grading:

* **Homework (60%)**  Homework assignments may be discussed with other students, but each student must complete by your own. Any submitted work that it copied from any source or too similar to be an independent write-up will not be given credit.
* **Group project (40%)** You will be assigned one group research project. Project topics will be related to cybersecurity practices. You will be required to use cutting-edge techniques to solve the proposed security problems.
	+ 2-3 students per group
	+ Select a seed idea for your group project
	+ Fully motivate the problem (5%)
	+ Survey related work (10%)
	+ Develop your own solutions – substantial novel technique development and implementation are expected (20%)
	+ A thorough empirical evaluation and comparing with baseline methods (20%)
	+ A fully developed project report (25%): 8 pages in ACM SIG Tighter Alternate style: [http://www.acm.org/sigs/publications/proceedings-templates#aL2](http://www.acm.org/sigs/publications/proceedings-templates)
	+ Project presentation (20%): 25min presentation + 10min Q/A

## Course Grading Scale:

90-100% = A
80-89.9% = B
70-79.9% = C
60-69.9% = D
Below 59% = F

## Late Assignments:

Any assignment not submitted by the due date/time will receive an automatic 20% grade deduction. Any late assignment not submitted by the drop box closing (generally 2 days after the original due date) will not be accepted and the grade will remain a 0. Please contact the instructor BEFORE the due date if you need to discuss an exception to an assignment due date. Note that absolutely no late assignments will be accepted for the Final Project.

## Attendance Policy:

The WVU Catalog contains the full [Attendance Policy.](http://catalog.wvu.edu/undergraduate/enrollmentandregistration/#enrollmenttext)

# WVU Academic Policies and Syllabus Statements

## Academic policies presented [here](https://tlcommons.wvu.edu/qualitymatters/syllabus-policies-and-statements#14) are those that are at the institutional level and exist in the WVU Catalog. Syllabus statements are Faculty Senate approved and provide guidance to students in negotiating other aspects of course experience.

1. [Academic Integrity Statement](https://tlcommons.wvu.edu/qualitymatters/syllabus-policies-and-statements#10)

The integrity of the classes offered by any academic institution solidifies the foundation of its mission and cannot be sacrificed to expediency, ignorance, or blatant fraud. Therefore, instructors will enforce rigorous standards of academic integrity in all aspects and assignments of their courses. For the detailed policy of West Virginia University regarding the definitions of acts considered to fall under academic dishonesty and possible ensuing sanctions, please see the West Virginia University [Academic Standards Policy](https://tlcommons.wvu.edu/qualitymatters/syllabus-policies-and-statements#13) below. Should you have any questions about possibly improper research citations or references, or any other activity that may be interpreted as an attempt at academic dishonesty, please see your instructor before the assignment is due to discuss the matter.

1. [Academic Standards Policy, including Academic Dishonesty](https://tlcommons.wvu.edu/qualitymatters/syllabus-policies-and-statements#13)
2. [Adverse Weather Statement](https://tlcommons.wvu.edu/qualitymatters/syllabus-policies-and-statements#2)
3. [Attendance Policy](https://tlcommons.wvu.edu/qualitymatters/syllabus-policies-and-statements#14)
4. [Campus Safety Statement](https://tlcommons.wvu.edu/qualitymatters/syllabus-policies-and-statements#9)
5. [Inclusivity Statement](https://tlcommons.wvu.edu/qualitymatters/syllabus-policies-and-statements%22%20%5Cl%20%224)

The West Virginia University community is committed to creating and fostering a positive learning and working environment based on open communication, mutual respect, and inclusion.

If you are a person with a disability and anticipate needing any type of accommodation in order to participate in your classes, please advise your instructors and make appropriate arrangements with [the Office of Accessibility Services](http://accessibilityservices.wvu.edu/).

More information is available at the [Division of Diversity, Equity, and Inclusion](http://diversity.wvu.edu/) as well.

1. [Incomplete Policy](https://tlcommons.wvu.edu/qualitymatters/syllabus-policies-and-statements#15)
2. [Sale of Course Material Statement](https://tlcommons.wvu.edu/qualitymatters/syllabus-policies-and-statements#6)
3. [Sexual Misconduct Statement](https://tlcommons.wvu.edu/qualitymatters/syllabus-policies-and-statements#7)
4. [Student Evaluation of Instruction Statement](https://tlcommons.wvu.edu/qualitymatters/syllabus-policies-and-statements#8)