CYBR 493A: CYBERSECURITY OPERATIONS

SYLLABUS FALL 2024

COURSE INFORMATION AND OVERVIEW

Course number and name: CYBR 493A, Cyber Operations
CRN: 87376, 3 credits, (2 lectures/week)

Class meets: On Tuesday, and Thursday @8:30AM - 9:45AM
Class location: Reynolds Hall| Room 4006

Pre-requisite: N/A

Textbook (Recommended):

Edrick Goad. (2021). Python for Cybersecurity: Automated Cybersecurity for the beginner. Independently published (June 30, 2021). ISBN-13: 979-8737011895

and Al Sweigart (2018). CRACKING CODES WITH PYTHON: An Introduction to Building and Breaking Ciphers. No Starch Press; Illustrated edition (January 23, 2018). ISBN-10: 1593278225, ISBN-13 : 978-1593278229

Optional Instructional Materials:
Selected peer reviewed papers and articles.

INSTRUCTOR INFORMATION

Instructor: Mohammad (MJ) Ahmad Ph.D.,

Email: mohammad.ahmad@mail.wvu.edu (Emails sent to @mix.wvu.edu account will be ignored). The best and preferred method of communication is via email.

Office location: 2109 Reynolds Hall.

Office hours: Tuesday and Thursday 10:00AM-12:00PM and open to students' availability, please use the Schedule Appointment link to schedule an appointment. If you wish to meet at other times, please email Dr. Ahmad.

Additional and optional channel of communication: Zoom.

COURSE DESCRIPTION

This Cyber Operations course is aimed at studying of contemporary topics selected from recent developments in the field and exploring various cybersecurity tools and practices to build a connection between the cyber concepts and the applications of these concepts into the real-world context. The class will focus on some basic system administration using Linux, MS Windows, and other cybersecurity tools, as well as the use of basic scripting for various cybersecurity problem sets. In this class, students are expected to build some cybersecurity tools using python and possibly bash scripting through a series of in-class projects, and group projects.

COURSE LEARNING OUTCOMES

This course focuses on the practical aspects of various cybersecurity operations and basic system administration tasks. The in-lab lectures are designed to explore different tasks using different scripting and cybersecurity tools.

At the end of the course, students should be able to:

1. Identify and implement different cybersecurity operations and tasks.
2. Use version control systems (i.e., GitHub) to develop, test, and manage computer software.
3. Build and analyze basic cybersecurity tasks, including but not limited to making paper cybersecurity cryptography tools, developing Reverse and Caesar Cipher, encryption, decryption, password hacking, and SQL injection.
4. Use different cybersecurity APIs and python libraries for cybersecurity activities.
5. Construct and evaluate frameworks for software vulnerabilities detection and classification.
6. Analyze and use different data sources to better understand the development of secure software systems.

Additional Benefits of Class: After completing this course, the students should be able to prepare independently for Python for Cybersecurity Specialization Certificate by Coursera and INFOSEC. Taking or passing this certificate is in no way a requirement for this class. However, if a student successfully passes the exam, they will automatically be awarded a 100% on the final exam/ project of this course. Students who want to obtain this certificate will need to discuss this will Dr. Ahmad at the beginning of the semester.

ASSESSMENTS

The on-campus labs and discussions along with the online activities and are designed to explore the main topics of this course. Students are expected to be active and involved in the following class activities:

- Reading: Students are expected to read and explore the relevant topics of assigned textbooks and any other additional materials (e.g., peer-reviewed publications and online resource) posted on eCampus.
- Lab activities: up to 14 individual in-lab activities will be assigned throughout this course. These labs are small-scale tasks with short and focused solutions. Each student is expected to fully complete each activity by the end of the assignment's week (ideally the Friday of each week).
- Homework: up to 4 homework assignments will be assigned throughout this course. Each homework will be an advanced problem which will require a more in-depth solution and innovative mindset to tackle.
- Group Project: There will be two group projects; one midterm and one final project. Each group can have up to 3 students and is expected to be formed no later than the 3rd week of classes. The topic of the project will be handed to students within a reasonable time before the due date. Each group is expected to submit a documented evidence of their work and present their work to the rest of the class. Peer assessment will be a portion of each project grade. Students, along with Dr. Ahmad, will evaluate each of the presentations and contribute to the final grade of each.

- Contribution evaluation: Each team member will be evaluated by their fellow team members twice throughout the semester. The first evaluation will occur at the midterm, and the second will be after the submission of the final project. Each member will be asked to assess the overall contribution, participation, responsiveness, and initiative of their teammates in working on the group assessments. Each student is expected to complete one evaluation for each of their group members.

- 2024 Cloud Analytics Fellowship: This class is part of the 2024 Cloud Analytics Fellowship offered by the National Oceanic and Atmospheric Administration (NOAA), in association with the NOAA Open Data Dissemination (NODD) weather datasets. We will use the NODD datasets to learn how to program tasks in Python and Linux, and to complete one of two final projects. The main goal is to deliver a project that uses the datasets to address societal problems. Each group will present their project in a pitch competition. Additional information will be provided to students during the first weeks of class.

GRADES

Performance on graded activities will be recorded in the grade book. Anticipate grades to appear within a week or two following the due date.

- Grading Scale: >90% A; 80-89.9% B; 70-79.9% C; 60-69.9% D; <60% F
- Course Grading:

Element	Component %
Homework (up to 4)	20%
In-Lab Activities (up to 14)	40%
Group Projects (2)	30%
Attendance/Participation	5%
Contribution evaluations	5%

CLASS POLICIES

Attendance Policy:

Attendance is mandatory in this class, students are required to record their attendance within 5 minutes of the beginning of the class, using the attendance sheet on eCampus. Students who miss more than 6 classes without a legitimate reason and without contacting Dr. Ahmad will lose up to 5% of the total course grade. This class will be offered on campus in the room and building stated above. Some bonuses will be handed out during the class, and only those attending can get credit for the

bonus assessments. If needed, this class might be streamed online, and students will be notified if any changes take place

The use of generative artificial intelligence:

Forms of writing assistance that utilize artificial intelligence (AI) to proofread a student's own written work (such as spellcheck or Grammarly) are acceptable. However, tools that rely on generative AI (such as GPT-3, ChatGPT, and Bard) that "write" (or generate) text from a prompt are not to be used to generate drafts or written work for any assignment in this course. If students are unsure which AI tools are acceptable, they should consult the instructor prior to using them.

Assessment's submission Policy:

Students are responsible for all material covered in the course, keeping track of assignments and examination dates. All materials will be posted on eCampus, and your assessments must be submitted in the expected formats by the given due dates on eCampus, submissions over email are not accepted. Any late work may be rejected without a grade except when a policy indicates otherwise. You should keep secure copies of your work in case of data loss.

Participation Policy:

Students can obtain participation credits in two formats; 1. In-class participation by submitting in-class activities and engaging with the in-class discussions, this will get students up to 5% of the course total grade. 2. Participating in the group projects where other group members get to evaluate their peers in the group. This will represent up to 10% of the total grade of each project.

Late Assignment and Missed Exam Policy:

All assessments should be submitted be the due date, a penalty of 20% will applied for late submissions, and 20% penalty will be applied for each late day. It is the student's duty to notify their instructor when submitting a late assessment. Make-ups for missing any of the assignments might be offered only to students who notified Dr. Ahmad ahead of time (at least 25 hours before due date) and before missing the assignment. Students who fail to notify Dr. Ahmad will not get a chance for makeup. Projects 1 and 2 will have no makeup.

Class manners:

Ensure that your conduct in this course is appropriate. Be attentive to the instructor and work only on assigned material. Do not converse disruptively. Treat all staff and students in a courteous and professional manner. Do not harass or be disruptive to the common morale. Do not foster a hostile or distracting environment. Violators are subject to similar sanctions as those for academic fraud.

Institutional Policies:

Students are responsible for reviewing policies on inclusivity, academic integrity, incompletes, sale of course materials, sexual misconduct, adverse weather, as well as student evaluation of instruction, and days of special concern/religious holiday statements.

ACADEMIC INTEGRITY STATEMENT

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, I will enforce rigorous standards of academic integrity in all aspects and assignments of this course. 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 Student Conduct Code at the WVU Campus Student Code's webpage. 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 me *before* the assignment is due to discuss the matter.

Notes:

* If you are learning, sensory, or physically disabled student, and feel you need special assistance regarding lectures, reading assignments, or testing, please contact me after class or during my office hours. The beginning of the semester is the best time to speak to me about this.

* West Virginia University is committed to social justice. I concur with this commitment and expect to foster a nurturing learning environment based upon open communication, mutual respect, and non-discrimination. Hey you, yes you! Good job reading through the syllabus, you have already gained yourself 2% bonus points. Email me stating you have found this secret message in the cyber493 syllabus; pictures of pets are encouraged. Do not tell others about this. Welcome to CYBR493. Our university does not discriminate based on race, sex, age, disability, veteran status, religion, sexual orientation, color, or national origin. Any suggestions as to how to create such a positive and open environment in this class will be appreciated and given serious attention.

REQUIRED SOFTWAREAND ONLINE SERVICES

The software listed below will be used in this class. We might add others if applicable.

1. Web browser
2. Python 3.6 and above (preferably using Anaconda).
3. PyCharm (free community edition).
4. Jupyter Notebook.(installed internally)
5. Git.
6. GitHub. (create an account using your mix account)
7. Oracle Virtual Box with Kali Linux
8. Text editor (MS Office or similar).
9. PostgreSQL DB

USEFUL LINKS

- Academic Calendar

- Final Exams calendar

EXPECTED TIMELINE

The following schedule is an estimate schedule of the topics covered in this class along with the designated week. This might change depending on the progress of students in the class. Some topics will either be added or dropped to give more time to focus on the projects and in class assessments.

Week #	Week date	Topic	Assessments (approximate)	Important Calendar dates
1	8/22 - 8/23	Course Introduction	Course policies acknowledgment form on eCampus is due	
2	8/26- 8/30	Chapter 1**: Introduction to Linux and Version Control		**August 27** - Last Day to Register, Add New Courses, Make Section Changes, Change Pass/Fail and Audit
3	9/1 – 9/6			
4	9/9 – 9/13	Chapter 2**: Python and IDEs		**September 2** - Labor Day Recess: University Closed
5	9/16 - 9/20		Homework #1 is due	
6	9/23- 9/27	Chapter 1*: Making Paper Cryptography Tools		
7	9/30- 10/4	Chapter 5**: Cryptography	Project 1 is due	
8	10/7- 10/11			**October 6** - Mid-Check Grades Due.
		Chapter 5*: The Caesar Cipher	Homework #2 is due	**October 11**- Fall break (No class)
9	10/14- 10/18	Chapter 6*: Hacking the Caesar Cipher with Brute-Force		
10	10/21- 10/25	Chapter 6**: Hacking Passwords		
11	10/28- 11/1			
12	10/31- 11/3	Chapter 8**: Intro to APIs	Homework #3 is due	

13	11/4- 11/8	Chapter 9*: Cybersecurity APIs		**November 5** - General Election Day: University Closed
14	11/11- 11/15			**November 15** - Last Day to Drop a Class and Last Day to Withdraw from the University.
		External sources: Vulnerability detection in software		
15	11/18- 11/22		Homework #4 is due	
16	11/25 - 11/29			**November 23- December 1**- Fall Recess (No classes)
17	12/2 – 12/6	SQL Injection and source code repository analysis	Project 2 is due Final project presentation (NOAA Dataset)	
18	12/10 – 12/12		Final project presentation (NOAA Dataset)	**December 12: Last Day of Classes** **December 13 -** Prep Day for Finals

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* Al Sweigart (2018). CRACKING CODES WITH PYTHON: An Introduction to Building and Breaking Ciphers

* All homeworks are due on Fridays @11:59PM of their given week.

** In class assessments can be in class or online if the instructor allows it.