Discipline	Course Number	Title
Computer Systems Security	205	CSS 205 07/17/2023-Essentials of Network Penetration Testing
College	Division	Department
Business and Computer Technologies	Business and Computer Technologies	Computer Science & Information Technology
Faculty Preparer		Edward Szurek
Date of Last Filed Assessment Report		

I. Review previous assessment reports submitted for this course and provide the following information.

1. Was this course previously assessed and if so, when?

> Yes
>
> Winter 2021

2. Briefly describe the results of previous assessment report(s).

> Both student learning outcomes (SLOs) met the then-defined standard of success. Mention was made of the overly broad objectives needing to be more targeted. This current assessment is being done prior to course updates.

3. Briefly describe the Action Plan/Intended Changes from the previous report(s), when and how changes were implemented.

> Two intended changes were proposed but never implemented. One was to create 3-4 more SLOs that target industry specific needs and certifications, the other to improve the lab environment used in this course. Both are in progress under a new faculty lead (myself) and pending for a future course update.

II. Assessment Results per Student Learning Outcome

Outcome 1: Use tools and techniques to identify vulnerabilities in computer networks.

- Assessment Plan

    o Assessment Tool: Laboratory reports

    o Assessment Date: Winter 2019

- Course section(s)/other population: Random sample of a minimum of two sections of CSS 205 over the three-year cycle

- Number students to be assessed: All

- How the assessment will be scored: Departmentally-developed rubric

- Standard of success to be used for this assessment: 70% of the students will score 70% or higher

- Who will score and analyze the data: Department faculty

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2022, 2021, 2020	2023, 2022, 2021	2022

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
168	135

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

Of the 168 students enrolled, only 166 have gradebook records with only 135 completing the course and final penetration test lab project. It is unknown why the students who did not complete the course did so, but it is assumed they dropped or withdrew. Only four of these submitted any later assignments for grading. This is not unexpected for a difficult course in a condensed format (7.5-week). Any incomplete or zero grades have been removed from analysis.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All students and sections were included regardless of format. The current course has only been offered online.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

Students' final assessment was to develop a Penetration Testing Report on the client selected at the beginning of the class and include content from the scope and sequence report and the reconnaissance report. The technical portion of the report is developed using the content from the labs that students completed throughout

this course (choose at least 5). The final assessment was evaluated using a rubric aligned to the course outcomes.

Data of student grades was accumulated from all available Blackboard gradebook exports and analysis was done in excel.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

Of the 135 students assessed, 109 (80.74%) scored over the metric of 70% on the final lab report project used for assessment.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Students are introduced to the industry-standard penetration testing toolset and gain proficiency in many tools and techniques necessary to conduct a penetration test. This is the majority of the course focus and frequently an area of high student engagement. Students leave the course able to conduct a basic vulnerability assessment and demonstrate exploits appropriate to those vulnerabilities, as well as communicate those findings to a client.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

Students should be encouraged to direct their own study with some of the tools available and demonstrate their usage beyond what has been explicitly taught, as this is a frequent task representative of conducting real penetration tests.

For continuous improvement, as was described in the prior assessment, the course needs to be updated to a more modern test environment to better represent current challenges in the field of penetration testing. Alignment with an industry certification could also be a potential improvement.

Outcome 2: Using the results from penetration testing, design and implement security procedures and countermeasures on the network and hosts.

- Assessment Plan
  - Assessment Tool: Laboratory reports

- Assessment Date: Winter 2019
- Course section(s)/other population: Random sample of a minimum of two sections of CSS 205 over the three-year cycle
- Number students to be assessed: All
- How the assessment will be scored: Departmentally-developed rubric
- Standard of success to be used for this assessment: 70% of the students will score 70% or higher
- Who will score and analyze the data: Department faculty

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2022, 2021, 2020	2023, 2022, 2021	2022

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
168	135

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

Of the 168 students enrolled, only 166 have gradebook records with only 135 completing the course and final penetration test lab project. It is unknown why the students who did not complete the course did so, but it is assumed they dropped or withdrew. Only four of these submitted any later assignments for grading. This is not unexpected for a difficult course in a condensed format (7.5-week). Any incomplete or zero grades have been removed from analysis.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All students and sections were included regardless of format. The current course has only been offered online.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

Students' final assessment was to develop a Penetration Testing Report on the client selected at the beginning of the class and include content from the scope and sequence report and the reconnaissance report. The technical portion of the report

is developed using the content from the labs that students completed throughout this course (choose at least 5). The final assessment was evaluated using a rubric aligned to the course outcomes.

Data of student grades was accumulated from all available Blackboard gradebook exports and analysis was done in excel.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

Of the 135 students assessed, 109 (80.74%) scored over the metric of 70% on the final lab report project used for assessment.

It should be noted that the SLO component "implement security procedures and countermeasures" is not part of this course and should be removed from the objective. Students are expected to provide a description of the appropriate risk countermeasures, but implementation is not a part of the course or final assessment.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Students are able to identify and communicate the remediations that are necessary to address the exploits found during their final penetration test lab project. The emphasis on effective communication here is important as this is where students (as penetration testers) are able to create value to organizations in the future.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

Currently students do not practice the actual implementation of any countermeasures as part of this assessment, nor spend any emphasis on it during the course. This is broadly appropriate as penetration testers do not generally do this in the field, and directing remediations is the desired scope. Additionally, much of this content is currently covered in other courses. I believe this SLO should be reworded and plan to do so in a future update.

For continuous improvement, I would like to bring standard compliance frameworks into the course content as this is an area many organizations must

meet and struggle to do so. This is another area penetration testers are looked to for expertise and is a core component of security policy design.

III. Course Summary and Intended Changes Based on Assessment Results

1. Based on the previous report's Intended Change(s) identified in Section I above, please discuss how effective the changes were in improving student learning.

N/A as the intended changes were not completed.

2. Describe your overall impression of how this course is meeting the needs of students. Did the assessment process bring to light anything about student achievement of learning outcomes that surprised you?

I believe this course is doing a very effective job in introducing students to the "tools of the trade" for the topic (penetration testing) and is correct to focus on lab reports as the primary method of assessment, mirroring typical industry deliverables. It does need to be updated to use more modern tools and environments.

A more surprising aspect to me is the low rate of completion for the course. 31/166 (18.6%) did not complete the class and roughly half of these (14) did start and make some progress in the course. I suspect this is due to the emphasis on writing (unusual for IT/cyber security courses) as well as the condensed format.

3. Describe when and how this information, including the action plan, was or will be shared with Departmental Faculty.

This will be shared with other faculty during our first department meeting this coming Fall 2023 semester.

4.

Intended Change(s)

Intended Change	Description of the change	Rationale	Implementation Date
Outcome Language	Remove "implement" from the 2nd SLO. Add additional outcomes to align with the expanded skills required of modern penetration testers, including (1)	Current outcomes are too broad in scope and have not evolved with job requirements.	2024

	address research of tools/exploits not explicitly covered in the course and (2) verification of compliance against existing standards. Update and align course objectives to updated SLOs.		
Assessment Tool	Assess outcomes separately	Future reports will assess each outcomes separately (including the new outcomes currently under development). The grading rubric will be adjusted to have specific separate graded elements, which will include at least one element related specifically to each individual outcome. The individual student scores for each separate outcome will be provided in future reports as well.	2023
Course Materials (e.g. textbooks, handouts, on-line ancillaries)	The current lab environment is hosted on premise at WCC using a NetLabs licensed solution. It is comprised of several end devices with vulnerabilities from 2005-2009 integrated to the environment. Updated and	Vulnerabilities from 2005-2009 provide an excellent learning opportunity to examine older and well-known examples, but fail to reflect modern challenges and opportunities that are relevant to current environments.	2024

	alternative solutions currently exist that the course's lab environment should be updated to. Course material (labs, lessons, Blackboard flow) will all need to be updated to the new environment.		
Other: Suggested changes from previous report	Implementing changes suggested from previous report.	Two intended changes from the previous assessment report are still in progress – we are in the process of creating more SLOs that target industry-specific needs and certifications, and are working on improvements to the lab environment used for this course.	2023

5. Is there anything that you would like to mention that was not already captured?

> 6.

III. Attached Files

[Assessment Rubric](#)
[Gradebook Data](#)

Faculty/Preparer: Edward Szurek **Date:** 07/25/2023
Department Chair: Scott Shaper **Date:** 07/29/2023
Dean: Eva Samulski **Date:** 08/04/2023
Assessment Committee Chair: Jessica Hale **Date:** 12/18/2023

Discipline	Course Number	Title
Computer Systems Security	205	CSS 205 05/21/2021-Essentials of Network Penetration Testing
College	Division	Department
Business and Computer Technologies	Business and Computer Technologies	Computer Science & Information Technology
Faculty Preparer		Cyndi Millns
Date of Last Filed Assessment Report		

I. Review previous assessment reports submitted for this course and provide the following information.

1. Was this course previously assessed and if so, when?

No

2. Briefly describe the results of previous assessment report(s).

3.

4. Briefly describe the Action Plan/Intended Changes from the previous report(s), when and how changes were implemented.

5.

II. Assessment Results per Student Learning Outcome

Outcome 1: Use tools and techniques to identify vulnerabilities in computer networks.

- Assessment Plan

    o Assessment Tool: Laboratory reports

    o Assessment Date: Winter 2019

    o Course section(s)/other population: Random sample of a minimum of two sections of CSS 205 over the three-year cycle

    o Number students to be assessed: All

    o How the assessment will be scored: Departmentally-developed rubric

- o Standard of success to be used for this assessment: 70% of the students will score 70% or higher

- o Who will score and analyze the data: Department faculty

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2020	2021, 2020, 2019	

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
88	73

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

73 of the 88 total students enrolled attempted the assessment. Students who did not make any attempt were not included in the analysis and likely abandoned or withdrew from the course.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All sections and all students were included in the assessment.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

Students' final assessment was to develop a Penetration Testing Report on the client selected at the beginning of the class and include content from the scope and sequence report and the reconnaissance report. **The technical portion of the report is developed using the content from the labs that students completed throughout this course (choose at least 5).** The final assessment was evaluated using a rubric aligned to the course outcomes.

Outcome 1 aligned to the Technical Report and Lab Content sections.

Outcome 2 aligned to the Management Report and Technical Report sections.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this

learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes
The standard of success was met with 86.4% of students (63/73) scoring a 70% or higher on the assessment.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Students performed well on the technical report and lab content areas of the final assessment, which is where the majority of the course was focused. They were able to identify vulnerabilities using a variety of tools and techniques, many of which are changing on a regular basis.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

Updated tools and labs need to be added to the course content, including providing a safe environment for students to complete a full penetration test as opposed to using the same labs that were assigned during the semester.

Outcome 2: Using the results from penetration testing, design and implement security procedures and countermeasures on the network and hosts.

- Assessment Plan

    o Assessment Tool: Laboratory reports

    o Assessment Date: Winter 2019

    o Course section(s)/other population: Random sample of a minimum of two sections of CSS 205 over the three-year cycle

    o Number students to be assessed: All

    o How the assessment will be scored: Departmentally-developed rubric

    o Standard of success to be used for this assessment: 70% of the students will score 70% or higher

    o Who will score and analyze the data: Department faculty

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2020	2020, 2019, 2021	

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
88	73

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

73 of the 88 total students enrolled attempted the assessment. Students who did not make any attempt were not included in the analysis and likely abandoned or withdrew from the course.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All sections and all students were included in the assessment.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

Students' final assessment was to develop a Penetration Testing Report on the client selected at the beginning of the class and include content from the scope and sequence report and the reconnaissance report. The technical portion of the report is developed using the content from the labs that students completed throughout this course (choose at least 5). The final assessment was evaluated using a rubric aligned to the course outcomes.

Outcome 1 aligned to the Technical Report and Lab Content sections.

Outcome 2 aligned to the Management Report and Technical Report sections.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

The standard of success was met with 81.2% of students (60/73) scoring a 70% or higher on the assessment.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Students were able to connect their lab activities to a penetration test at a broad level.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

Updated labs and lab environment will help students build a better penetration testing plan that will allow for customization and recommendations on policy and compliance.

III. Course Summary and Intended Changes Based on Assessment Results

1. Based on the previous report's Intended Change(s) identified in Section I above, please discuss how effective the changes were in improving student learning.

n/a

2. Describe your overall impression of how this course is meeting the needs of students. Did the assessment process bring to light anything about student achievement of learning outcomes that surprised you?

Since I teach the course, I am very aware of the deficiencies that exist. What this assessment did bring to light (besides needing a better lab environment) is that the outcomes are very broad and assessed in a manner that could be subjective due to writing and organization of the final report. I would like to see more targeted outcomes based on current industry standards and certifications and will be updating the master syllabi to reflect this.

3. Describe when and how this information, including the action plan, was or will be shared with Departmental Faculty.

This report will be shared with faculty in the next department meeting.

4.
Intended Change(s)

Intended Change	Description of the change	Rationale	Implementation Date
Outcome Language	Create 3 to 4 more outcomes that are targeted at industry specific needs and certifications.	The current outcomes are too broad to assess in an effective and objective manner.	2022

	The course labs and activities need to be built around a better pen testing lab environment that will allow for an overall penetration test experience.	Currently, there are individual labs that do not connect together in a meaningful way to demonstrate an actual penetration test.	2022
Course Materials (e.g. textbooks, handouts, on-line ancillaries)			

5. Is there anything that you would like to mention that was not already captured?

6.

III. Attached Files

Assessment Rubric Data

Faculty/Preparer: Cyndi Millns **Date:** 05/21/2021
Department Chair: Cyndi Millns **Date:** 05/25/2021
Dean: Eva Samulski **Date:** 06/16/2021
Assessment Committee Chair: Shawn Deron **Date:** 10/01/2021