Assessment Plan

for

M.S. in Cybersecurity

Department of Computer Science and Engineering
School of Engineering and Computer Science
Oakland University

Overview of the CSE Dept. Assessment Process.

The Department of Computer Science and Engineering already offers two master's degree programs. The new program, Master's program in Cybersecurity, would utilize the same assessment procedures. The Assessment process used in the CSE Department has been developed over the years in conjunction with other departments from the school of Engineering and Computer Science and refined to satisfy the relevant accreditation bodies. The assessment plan is driven by the goals and mission of the department which are in line with the goals and missions of Oakland University and those of the SECS.

Goals and Objectives of the M.S. Program.

1. Oakland University's Goals (from Mission Statement)

Programs and activities within the Computer Science and Engineering (CSE) department are in line with the following goals of the Oakland University extracted from the University mission found at http://www4.oakland.edu/?id=1654&sid=106:

A. *It offers instructional programs of high quality that lead to degrees at the baccalaureate, master's and doctoral levels as well as programs in continuing education;*
B. *It advances knowledge and promotes the arts through research, scholarship, and creative activity; and*
C. *It renders significant public service.*

2. School of Engineering and Computer Science's Goals (from mission statement)

The School of Engineering and Computer Science mission, found in the school website at http://www2.oakland.edu/secs/, states that the overall mission of the School of Engineering and Computer Science is threefold:

A. *To provide high-quality undergraduate and graduate programs of instruction in engineering and computer science to prepare graduates for careers in the coming decades,*
B. *To advance knowledge through basic and applied research in relevant branches of engineering and computer science, and*
C. *To provide service to both the engineering profession and public of the State of Michigan.*

3. Department of Computer Science and Engineering's Goals (from mission statement)

The CSE mission, found in the department's website at http://www.cse.secs.oakland.edu/ oakland.edu/secs/, states that the overall mission of the Department of Computer Science and Engineering is threefold:

A. *To provide high-quality graduate programs of instruction in Computer Science and Engineering to prepare graduates for careers in the coming decades,*

B. *To advance knowledge through basic and applied research in Computer Science and Engineering, and,*
C. *To provide service to the Computer Science and Engineering profession.*

4. Learning Outcomes of the Master program in Cybersecurity

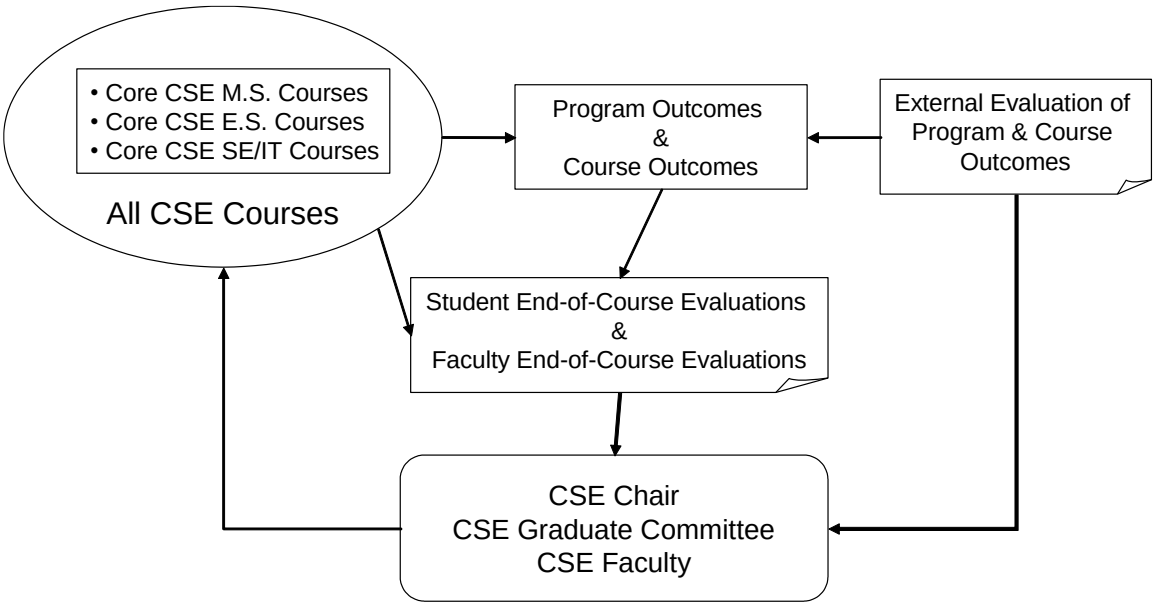
The master program was developed to serve the mission of the department and meet the needs of its main constituents. A set of learning outcomes were identified. They are listed below.

1. Explore leadership, theory, tools, skills, and practices as it applies to safeguarding the security and privacy of today and tomorrow's cyber infrastructure.
2. Understand fundamentals and state of the art of today's cyber technology.
3. Understand fundamentals and advanced issues of various threats faced by today's cyber infrastructure.
4. Understand cybersecurity and privacy needs of today's institution.
5. Acquire solid knowledge on applied cryptography, which serves as the basis for the development of mainstream cybersecurity models and methods.
6. Acquire knowledge on information technology, software systems, and network systems, which serves as the basis for the development of many emerging non-cryptographic methods for protecting security and privacy.
7. Study commonly-used cybersecurity tools and acquire hands-on experience through directed exercise and experiments.
8. Understand intellectual property law and cyber law.
9. Describe the synthesis of data and information for risk (vulnerability) assessment for the cyber infrastructure.
10. Integrate evidence-based practice into system reviews to design, implement, and evaluate plans of security.
11. Design, coordinate, evaluate, and deliver cybersecurity solutions in a timely and cost-effective manner.
12. Strategically plan on integrating cybersecurity within the overall improvement of the cyber infrastructure of the institution.
13. Provide cybersecurity-related recommendation to higher-level system administrator in key decision-making process.
14. Understand the role, scope, and limitations of cybersecurity administrators, while incorporating professional standards into practice.
15. Explore the evolving role of cybersecurity administrator in an institution.
16. Analyze vertical and horizontal leadership strategies of cybersecurity administrator in an institution.
17. Apply appropriate teaching/learning strategies to facilitate learning and education of colleagues on cybersecurity.
18. Develop personal goals for professional development and continuing education.
19. Demonstrate skills of mentoring the next generation of cybersecurity professionals.
20. Integrate relevant research findings into cybersecurity practice.

5. How the Learning Outcomes are met

The CSE Dept. faculty has chosen an embedded approach to program assessment. Key courses have been identified in the M.S. program where students have the opportunity to demonstrate the achievement of the program outcomes; the sets of key courses are chosen to ensure that all of the program outcomes are demonstrated. Student materials are collected from the key courses that provide evidence that the outcomes have been achieved. External evaluators, including faculty not directly involved with the course and departmental advisory board members, review these materials to establish whether the students in that class have achieved some or all of the program outcomes. Every semester, the CSE Dept. faculty review the results of these external evaluations and generate appropriate plans to improve the achievement of the program outcomes.

Each CSE course has a set of course outcomes, developed by the instructing faculty and CSE Graduate Committee, which ensure the logical sequence of topics necessary to the eventual achievement of the program outcomes. At the end of each semester, the students and faculty in each course rate how well that particular course section achieved its objectives. The faculty identifies the specific program outcome(s) achieved in the course and provide evidence in support of their contention. In addition, students and faculty are encouraged to comment on how well the course fits into the overall scheme of the program and to suggest improvements to the course, the course outcomes and the overall program of study. The CSE Dept. holds a faculty meeting at the beginning of each semester to review all external evaluations and end-of-course evaluations from the prior semester and develop any needed plan for improvement.



Measures.

The overall success of the M.S. in CSE is measured by whether the students can demonstrate achievement of all learning outcomes as they graduate. In order to assess the students' achievement, the CSE Dept. faculty have selected one direct measure and one indirect measure.

Direct Measure. Key courses are identified in each of the M.S. programs where students have the opportunity to demonstrate the achievement of the program learning outcomes. These courses are chosen to ensure that all of the learning outcomes are demonstrated.
When a key course is under review, student materials are collected that provide evidence that the outcomes have been achieved, such as homework assignments, laboratory assignments, project assignment and exams. External evaluators (faculty not directly involved with the course, engineers from industry and CSE Dept. Advisory Board members) review these materials to establish whether the students in that class have achieved some or all of the program outcomes.

The rubric used by the external evaluators is presented in Appendix A. Note that every assignment is not expected to demonstrated competency in all learning outcomes. Hence, a customized rubric containing only the appropriate learning outcomes is generated for each assignment. The rubrics are generated by any CSE Dept. faculty member from the SECS assessment website. The CSE Dept. faculty meet to review the results of these external evaluations and generate appropriate plans to improve the achievement of the program outcomes.

Indirect Measure. Each CSE M.S. course has a set of course outcomes, developed by the instructing faculty and the CSE Dept. Graduate Committee, which ensure the logical sequence of topics necessary to the eventual achievement of the program outcomes. At the end of each semester, the students in each course rate how well that particular course section achieved its outcomes (Appendix B contains an example rubric for CSE 550). The CSE faculty review all of these course evaluations each semester at a department faculty meeting and generate appropriate plans to improve the achievement of the program outcomes.

Documentation of Assessment Process.

All actions taken at each step of the assessment process are documented properly. This record is used by the CSE faculty to evaluate and improve the assessment process.

CSE Dept. Faculty Involved in the Assessment Process.

All CSE Dept. faculty members are involved in the assessment process.

Appendix A - Example External Evaluation Form (Direct Measure)

SECS External Evaluation of Program Outcomes - Graduate
Example Assignment
Fall 2007

Evaluator: _____ **Date:** _____

Identification of student(s) or group:

Please rate how well the student work presented demonstrates the following program outcomes, using a scale from 0-100. Ratings of 70 or higher are considered acceptable levels of accomplishment. Include any comments to justify or explain your ratings.

An ability to design and analyze a product or process to satisfy a client's needs subject to constraints.	
Comments:	
An ability to apply the skills and knowledge necessary for mathematical, scientific, and engineering practices.	
Comments:	
An ability to interpret graphical, numerical, and textual data.	
Comments:	
An ability to use modern engineering tools.	
Comments:	
An ability to recognize when information is needed and to have the ability to locate, evaluate, and use effectively the needed information.	
Comments:	

Evaluators:

Thank you for volunteering to assess the graduate engineering programs of the SECS. This service helps us continuously improve our programs of study in order to better serve our students.

You will be examining student work which has been selected by the instructor because (s)he believes that it demonstrates one or more of the outcomes of the program of study. Your task is to rate how well the student work that you are examining demonstrates the program outcomes. In order to focus your evaluation, the instructor may have provided examples of what (s)he thinks may be relevant material or topics to consider or look for. As a guide to assigning ratings, 70% or above is considered to be an acceptable level of accomplishment. Include comments to explain or justify your ratings.

It is important to understand that you are not grading the student work. The students will receive, or have already received, their grades from their instructor.

Department Graduate Curriculum Committee Chairs:

Please compute the averages of all of the rating sheets for all evaluators, and enter them in the online External Evaluation of Program Outcomes database. You must keep the original evaluation sheets, and the student work that has been evaluated, for a period of three years.

Score	Rating	Description
90-100	Excellent	All assumptions, justifications and arguments are based on thorough and exhaustive mathematical analysis, experiments, computer simulations and/or research; research appears thorough and complete and is thoroughly documented; presentations are very well organized, easy to follow and exhibit thorough command of English.
80-89	Very Good	Most assumptions, justifications and arguments are based on thorough mathematical analysis, experiments, computer simulations and/or research; research appears complete and is well documented; presentations are well organized and exhibit good use of English.
70-79	Good	Some assumptions, justifications and arguments are based on thorough mathematical analysis, experiments, computer simulations and/or research; research appears complete and is documented; presentations are organized and exhibit standard use of English.
60-69	Below Average	Most assumptions, justifications and arguments do not appear based on mathematical analysis, experiments, computer simulations and/or research; research is missing, and/or undocumented; presentations are not organized well and exhibit sub-standard use of English.
50-59	Poor	Assumptions, justifications and arguments are not based on mathematical analysis, experiments, computer simulations and/or research; research is missing and/or undocumented; presentations are poorly organized and exhibit poor use of English.

Appendix B – Example Student Evaluation Results (Indirect Measure)

CSE 450 Winter 2008
Class Password: CSE10482
Instructor: Guangzhi Qu
Faculty Rank: Assistant Professor

Below are the Course Objectives, Ratings: (E=EXCELLENT; G=GOOD; A=AVERAGE; P=POOR; U=UNSATISFACTORY; NA=DOES NOT APPLY), Total Ratings, the Average Grade, and the Total Average Grade for course objectives. The numbers below each rating are the total number of students who gave that rating for the course objective.

Course Objectives	E	G	A	P	U	NA	Total Ratings	Median	Standard Deviation	Avg Grade
1. Describe what characterize an OS, what they do and how they are designed and constructed										
2. Recognize and distinguish the hardware parts that are necessary to understand an OS										
3. Define a process (or a thread) and the notion of concurrency correctly since they are the heart of modern operating systems										
4. Distinguish between OS processes and user processes										
5. Describe methods for process scheduling, inter-process communication, process synchronization and deadlock handling										
6. Describe the role of the main memory for a process execution and the algorithms related to memory management including virtual memory										
7. Compass the file-system interface features such as file attributes, directory structure, acyclic graph directories and file sharing										
Total Average Grade for Course Objectives =										

Below are the Section Objectives, Ratings: (E=EXCELLENT; G=GOOD; A=AVERAGE; P=POOR; U=UNSATISFACTORY; NA=DOES NOT APPLY), Total Ratings, the Average Grade, and the total grade for the section objectives. The numbers below each rating are the total number of students who gave that rating for the section objective.

Section Objectives	E	G	A	P	U	NA	Total Ratings	Median	Standard Deviation	Avg Grade

Below are the Evaluation Questions, Ratings: (E=EXCELLENT; G=GOOD; A=AVERAGE; P=POOR; U=UNSATISFACTORY; NA=DOES NOT APPLY), Total Ratings, Your Rank, the Average Grade, and the Total Average Grade for each question. The numbers below each rating are the total number of students who gave that rating for the question. The Rank column provides your ranking for that specific question out of the total number of rankings (not necessarily the total number of instructors) for that question. For instance, if there are 5 instructors and 2 of them receive a rank of 1, then the total number of rankings is 4.

Evaluation Questions (Ratings)	E	G	A	P	U	NA	Total Ratings	Rank	Median	Standard Deviation	Avg Grade
1. Making the objectives of the course clear to me.											
2. Developing and presenting the course material in a clear and organized manner.											
3. Stimulating and deepening my interest in the subject.											
4. Motivating me to do my best work.											
5. Explaining and clarifying difficult material and problem solutions.											
6. Willingness to provide individual assistance to students outside of classroom hours.											
7. Ability to handle questions from the class.											
8. Utilization of class time.											
9. Utilization of instructional aids such as blackboard, slides or viewgraph.											
10. Uniformity and impartiality in grading.											
11. Promptness in returning homework, laboratory reports and examinations.											
12. Overall rating as a teacher											
13. Value of the textbook											

contribution to the course											
14. Value of the recitation component of the course.											
15. Value of the laboratory component of the course.											
16. Adequacy of the computing and/or laboratory facilities.											
17. Overall rating of this course as a learning experience.											
Total Average Grade for Instructor Evaluation Questions =											

*Note: Again, more than 1 instructor can have the same rank. (For example: If 4 out of 100 instructors receive a grade of 4.0, then all 4 instructors receive a rank of 1.)

Below are the Evaluation Questions and the students responses to each question.

Evaluation Questions (Comments)	
18. INSTRUCTOR	
19. COURSE	
20. GRADING AND EVALUATION	
21. OTHER	

Below is the Student Profile section.

Student Profile						
1. Hours spent per week outside the classroom for this course.	**Over 9**	**6-9**	**4-6**	**2-4**	**0-2**	**Total Answer**
2. Your assessment of the amount of material covered in this course.	**Much Too Much**	**Too Much**	**Just Right**	**Too Little**	**Much Too Little**	**Total Answer**
3. What grade do you expect to receive in this course?	**3.50-4.00**	**3.00-3.49**	**2.50-2.99**	**2.00-2.49**	**Below 2.00**	**Total Answer**
4. What is your approximate cumulative grade point average?	**3.50-4.00**	**3.00-3.49**	**2.50-2.99**	**2.00-2.49**	**Below 2.00**	**Total Answer**

Below are the final grades for this course section

Course Objective =	
Section Objective =	
Evaluation Questions =	
Final Grade =	

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Goal Cited In OU Mission	Relevant Goal Of Unit	Student Learning Outcomes	Methods of Assessment	Individual(s) Responsible for Assessment Activities	Procedures for Using Assessment Results to Improve Program
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		12. Strategically plan on integrating cybersecurity within the overall improvement of the cyber infrastructure of the institution 13. Provide cybersecurity-related recommendation to higher-level system administrator in key decision-making process 14. Understand the role, scope, and limitations of cybersecurity administrators, while incorporating professional standards into practice. 15. Explore the evolving role of cybersecurity administrator in an institution. 16. Analyze vertical and horizontal leadership strategies of cybersecurity administrator in an institution. 17. Apply appropriate teaching/learning strategies to facilitate learning and education of colleagues on cybersecurity. 18. Develop personal goals for professional development and continuing education. 19. Demonstrate skills of mentoring the next generation of cybersecurity professionals. 20. Integrate relevant research findings into cybersecurity practice.			