



College of Computer and Information Sciences

Information Technology Department
Cybersecurity and Digital Forensics (CSDF)

Program Learning Outcomes Assessment Plan

MS in Cybersecurity and Digital Forensics (CSDF)

Program Learning Outcomes Assessment Plan

Program Learning Outcomes (Student Outcomes)

SO(1) Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions

SO(2) Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program’s discipline

SO(3) Communicate effectively in a variety of professional contexts

SO(4) Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles

SO(5) Function effectively as a member or leader of a team engaged in activities appropriate to the program’s discipline

SO(6) Identify and analyze user needs and to take them into account in the selection, creation, integration, evaluation, and administration of computing-based systems.

SO(7) An ability to apply knowledge of computing and mathematics appropriate to the discipline

SO(8) An ability to understand a problem and identify the computing requirements appropriate to its solution

The mapping between NCAAA PLOs and SOs is shown Table 1.

Table 1 Mapping between NCAAA PLOs and SOs

K1	S1	S2	S3	S4	S5	V1	V2
SO(8)	SO(1)	SO(2)	SO(3)	SO(6)	SO(7)	SO(5)	SO(4)

Program Education Objective (PEOs)

The program will produce graduates who:

1. Practice as computing professionals in areas of Cybersecurity and Digital Forensics with an appropriate combination of theoretical knowledge and hands-on skills.
2. Enhance their skills in wide aspects of the security of information systems and specialized skills in computer security incidents and crime evidence and master new computing technologies through self-directed professional development or conduct research in Cybersecurity and Digital Forensics field.
3. Follow a career path toward leading positions in the Cybersecurity and Digital Forensics field.

NCAAA PLO	PEO1	PEO2	PEO3
K1	x		
S1	x		
S2	x	x	

S3			x
S4	x	x	x
S5	x		
V1		x	x
V2			x

The Student Outcomes are mapped to NCAAA Program Learning Outcomes which are based on SAQF(Saudi Arabia Qualifications Framework.) Table 2 below shows the SAQF Bachelor Level Descriptors.

Table 2 -SAQF Level 7 (Bachelor) Descriptors of Learning Outcomes and Performance Criteria

Knowledge Domains SOs Distribution Based on Saudi Arabia Qualification Framework (SAQF) – 2020 version
<p>1. Knowledge and understanding</p> <p>At this level, the graduate will have:</p> <ul style="list-style-type: none"> – A broad, in-depth and integrated structure of knowledge and understanding of the theories, principles and concepts involved, in one or more areas of specialization or work; – Knowledge and in-depth understanding of processes, materials, techniques, practices, assumptions, and/or terminology; – A wide range of specialized knowledge and understanding based on recent developments in the field of specialization, profession or work; – Knowledge and understanding of research methodology and survey methods

2. Skills

At this level, the graduate will have a wide range of cognitive, practical and physical skills, communication skills, information technology and advanced communications to:

Cognitive skills:

- Apply concepts, principles and theories involved and integrated in different contexts in the field of specialization, profession or work;
- Solve problems in complex and diverse contexts, in one or more areas of specialization or work;
- Employing critical thinking and developing creative solutions to current issues and problems in complex and diverse contexts, in the field of specialization, profession or work;
- Practice survey, verification and research into complex issues and problems.

Practical and physical skills:

- Use and adapt advanced processes, techniques, tools, devices and/or materials for complex and diverse practical activities;
- Perform a range of complex and varied practical tasks and procedures associated with specialization, professional practice or work.

Communication skills, IT:

- Communication in appropriate ways to demonstrate understanding of theoretical knowledge, and to convey specialized knowledge, skills and complex ideas to a variety of recipients;
- Use of mathematical processes and quantitative methods to process data and information in complex and diverse contexts, associated with a field of specialization or work;
- Choose, use and adapt a variety of digital technology and ICT tools and applications to process and analyse data and information, support and/or projects

3. Values, independence and responsibility

At this level, within a range of complex and diverse contexts, a graduate can:

Values and ethics:

- Demonstrate commitment to professional and academic values and standards and the Code of Ethical Conduct, representing responsible citizenship and coexistence with others.

Independence and responsibility:

- Building plans for academic and/or professional self-development, working to achieve them effectively, assessing its learning and performance, and making decisions about self-development and/or tasks based on convincing evidence and independence;
- Manage specialized tasks and activities, and/or work in a professional and independent manner.
- Working collaboratively and constructively, leading a variety of teams, to perform a wide range of tasks responsibly, and to play a key role in planning and evaluating joint action;
- Active participation in the development of specialization and society.

Program Learning Outcomes Assessment

SO (PLO) assessment process

The assessment of student outcomes is performed every semester through direct and indirect

assessments. All student outcomes are considered to be attained when the average score reaches 70 % and above.

Direct assessment:

- **The assessment is performed on the defined assessment tools for all the courses. The assessment tools are provided in the course portfolio.**

Indirect assessment:

- **This is mainly used as a supplementary assessment measure and is done through the following surveys:**
 - **Course surveys**
 - **Research project survey**
 - **Exit survey**

Figure illustrates various direct and indirect assessment methods

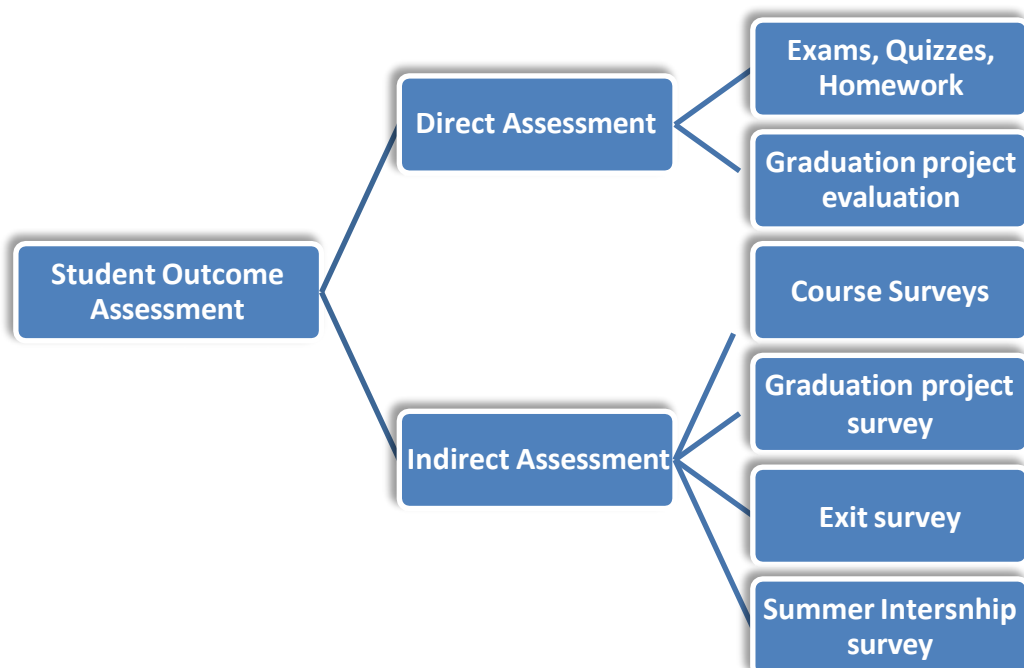


Figure Student outcomes assessment

Table below describes the instruments that are used in direct and indirect assessment of student outcomes.

Table Students outcomes assessment tools – Direct and Indirect

	Assessment Tool	Frequency	Media	How Collected	Source	Collected by	Evaluated by
Direct	Mid exam, Class test, Quiz, Assignment, Final Exam	Every Semester	Course Assessment Report	Paper	Faculty Members	Quality Unit	Measurement and Evaluation Unit
Indirect Assessment	Course Surveys	Every Semester	Survey	Paper / Electronic	Faculty Members	Faculty Members	Measurement and Evaluation Unit
	Exit Surveys	Every Semester	Survey	Paper / Electronic	Faculty Members	Quality Unit	Measurement and Evaluation Unit
	Research Project Surveys	Every Semester	Survey	Paper / Electronic	Faculty Members	Graduation Project Coordinator	Measurement and Evaluation Unit

Direct Assessment

In the CS program, each course targets a subset of the student outcomes with a certain percentage. These outcomes are directly assessed in every course using pieces of student work (questions in exam, homework, project, etc.,) Specific questions from the desired assessment tools are designed to assess a targeted outcome in the course. The designated level of performance (60% and above) indicates the achievement of SOs in the course.

In every course, the faculty member is expected to assess the achievements of the relevant student outcomes in the course. The final assessment is preferably done close to the end of the

semester.

The faculty member prepares a direct assessment report and evaluates the student outcome achievement in each course. If the assessment revealed any weaknesses in a specific student outcome, the faculty should identify the cause and propose corrective action plan that can be implemented in the course or in one of the prerequisite courses in order to improve that specific outcome achievement in the future.

The proposed corrective actions are implemented in the following semester and their impact on the specific outcome achievement shall be assessed.

The measurement and evaluation unit aggregate the outcomes achievement in all courses in CS program and computes the average score. If an outcome achievement appears to be unsatisfactory, the faculty member/department propose corrective action plan at the course level, the curriculum level, or both.

Different courses contribute to a specific outcome achievement at the program level depending on their number of credit hours and the percentage by which they target that specific outcome.

The student outcomes' assessment process is conducted every semester.

Each course instructor provides direct assessment reports and outcome evidences:

- **Brief description of the student works used to measure the achievement of student outcomes (assignments, projects, exams, etc.),**
- **A description of which specific work is meant to assess which outcome.**
- **Student outcomes achievement.**
- **Analysis of the student outcomes achievements and identifying strengths and weaknesses.**
- **Proposals to fix any identified weaknesses to be applied during the following semester.**
- **Samples of students' work.**
- **The measurement and evaluation unit reviews the provided material and checks:**
 - **to what extent did the students demonstrate they attained every outcome,**
 - **whether the work evidence is appropriate for the assessment and**
 - **the adequacy of the improvement proposals with regards to the identified improvement area.**
- **The measurement and evaluation unit then writes a report to the quality unit with their findings. The findings are processed by the quality unit and forwarded to department.**
- **The measurement and evaluation unit keeps track of the improvement proposals and checks the achieved improvement at the end of the following semester.**

Indirect Assessment

The indirect assessment consists of the following processes:

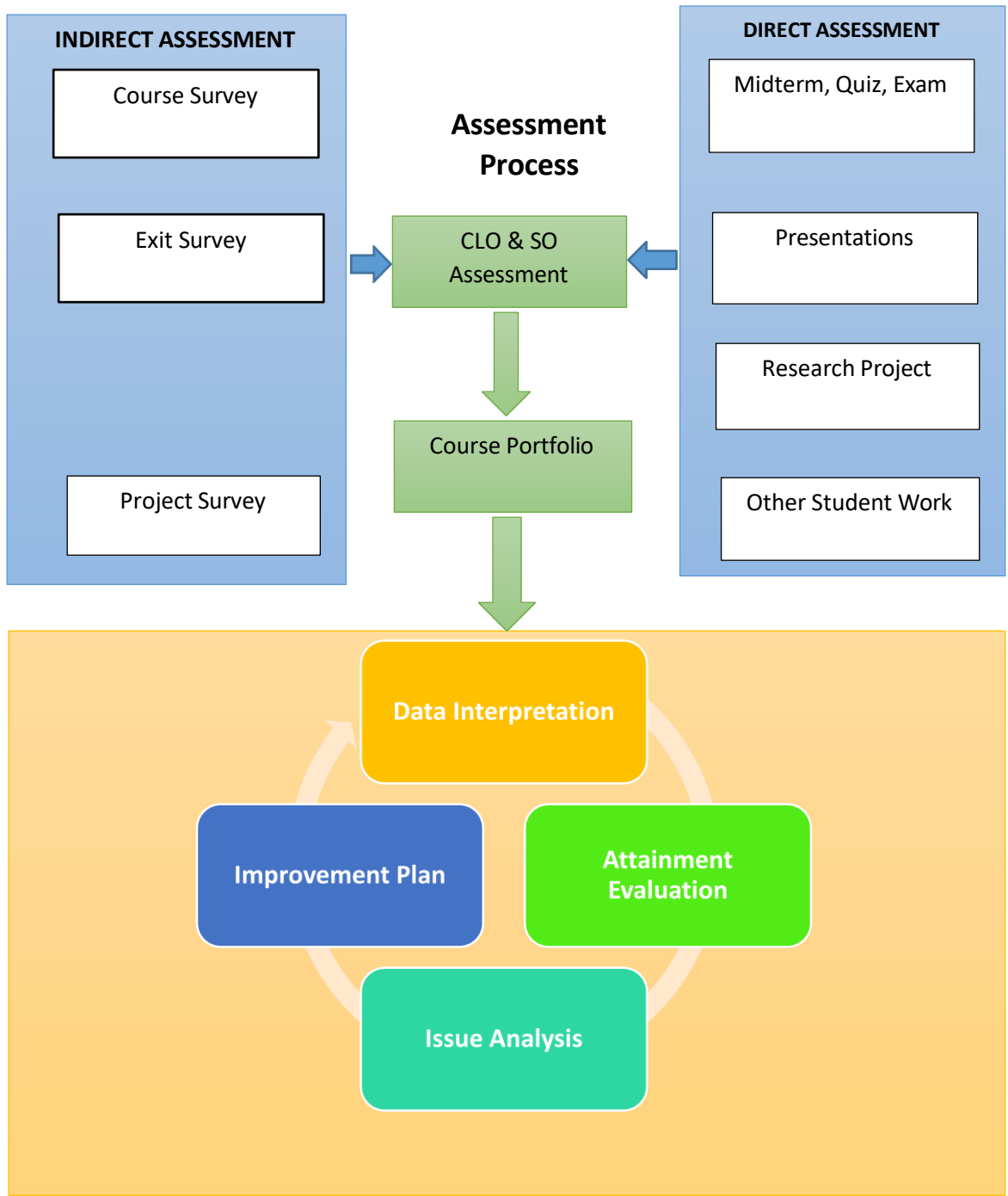
- Course survey
- Research project survey

- Exit survey

Evaluation Processes

1. **Data Interpretation:** Metrics are used to summarize data and its interpretation based on the points of interest. For example, the survey responses are used to calculate weighted averages scored of SOs.
2. **Attainment Evaluation:** The attainment of evaluation for all the SOs are measured in this step. For example, the verification of the SO achievement from various data sources with reference to the threshold values (EE-Exceeding Expectation, ME-Meeting Expectation, PE-Progressing towards Expectation & DNME-Does Not Meet Expectation) are carried out.
3. **Issue Analysis:** Wherever the evaluation of targeted SOs are not achieved, an issue based deeper analysis is conducted. For example, reviewing faculty course assessment reports, discussing with faculty and students to determine underlying issues for poor achievement.
4. **Improvement plan:** An action plan is developed to remedy the identified issues and recommended implementation over the issue.

Error! Reference source not found. summarizes assessment and evaluation of SOs.



Assessment and Evaluation Processes

Mapping between IT Program Learning Outcomes and SAQF descriptors is shown in below Table 3.

Table 3: Mapping between IT Program Learning Outcomes and SAQF Descriptors

NCAAA Code	ABET Code	SO Descriptor	Teaching Strategies	Assessment Methods
K1	SO(8)	An ability to understand a problem and identify the computing requirements appropriate to its solution	Classroom Teaching	Class Test, Mid Exam, Final Exam
S1	SO (1)	Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions	Classroom Teaching	Class Test, Mid Exam, Final Exam
S2	SO (2)	Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline	Mini Project, Lab Exercises	Lab Based Assignments, Mini Project
S3	SO (3)	Communicate effectively in a variety of professional contexts	Oral /Written Communication, Seminar	Group Assignments, Mini Project
S4	SO (6)	Identify and analyze user needs and to take them into account in the selection, creation, integration, evaluation, and administration of computing-based systems. [IT]	Mini Project, Graduation Project, Lab Exercises	Case Study Implementation/ Laboratory /Mini project
S5	SO (7)	An ability to apply knowledge of computing and mathematics appropriate to the discipline	Classroom Teaching	Class Test, Mid Exam, Final Exam
V1	SO (5)	Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline	Mini Project, Graduation Project, Lab Exercises	Oral or Written Communication, Seminar
V2	SO (4)	Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles	Classroom Teaching, Graduation Project	Class Test, Mid Exam, Final Exam

The PLO assessment is done for the courses mentioned below. Some electives may not be offered depending on the tracks. All the PLOs are covered by various subjects as shown in Table 4.

Table 4: Mapping between Courses and PLOs

Course code & No.	Program Learning Outcomes												
	Knowledge and understanding				Skills					Values, Autonomy, and Responsibility			
	K1	K2	K3	---	S1	S2	S3	S4	S5	V1	V2	----	
IT 601 Cybersecurity Foundations	I				I						I		
IT 602 Digital Forensics Technology and Practices	I				I	I		I				I	
IT 603 Information Security Law, Policy, and Ethics	I				I		I				I	I	
IT 604 Cybersecurity Technology and Management	P				P		P				P	P	
IT 605 Research Methods and Engineering Statistics	M				M		M		M		M	M	
Electives													
	K1				S1	S2	S3	S4	S5	V1	V2		
IT 611 Network and System Security	P				P	P						P	
IT 612 Malware and Vulnerability Analysis	P				P	P						P	
IT 613 Cryptography and Cryptanalysis	P				P	P						P	
IT 614 Software Security	M				M	M						M	

