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المملكة العربية السعودية
وزارة التعليم
جامعة الجوف
كلية علوم الحاسب والمعلومات
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Mechanism for Measuring

Program Learning Outcomes

and

Graduate Attributes

--Program Evaluation--

Computer Engineering and Networks Program

Program Evaluation Process:

The process of assessment and evaluation of the CEN program is summarized in the figure 1. The evaluations of the program leaning outcomes are utilized as feedback for improvement and incorporated into planning to enhance the overall attainment of the program learning outcomes. There are two types of assessment to regularly assess and evaluate the extent to which the program learning outcomes are being attained, namely direct assessment through the evaluation of exams and students works and indirect assessment through surveys.

Direct Assessment:

For measuring the attainment of the program learning outcomes (PLOs) from direct assessment , the following steps should be first applied at the CEN courses to obtain the level of course learning outcomes (CLOs) attainments of the students that are later used for measuring the PLO achievements:

1. Intended course learning outcomes (CLOs) are defined for all courses.
2. During course design, different assessment method(s) suitable for intended CLO are specified.
3. For a given course, each learning outcome assessment is treated and carried out individually independent of the rest of learning outcomes. The criteria for success are the measurable performance targets associated with the assessment instruments and evaluation rubrics used by the program in determining whether the intended learning outcomes have been achieved.
4. At the end of each semester, every faculty member is required to submit a course assessment report submitted as a part of the course file for each course. The course assessment report specifies the extent of attainment of the learning outcomes covered by each course. It is important to mention that each of the CLO should be associated with one of the chosen PLO. If more than one CLO are associated with the same PLO, then the weighted average over the concerned CLOs is considered as the contribution of the course to the intended PLO. The attainment of each CLO is measured by the rate of students attaining a predefined target over the total number of the students in the course.

5. The PLO achievement from the direct assessment will be carried out according to the executive plan for measuring the program learning outcomes of the CEN program which is delivered each year to determine the set of courses contributing to each program learning outcome. Note that only high level courses (capstone course) are chosen for measuring the attainment of the PLOs in the CEN program. PLO achievements from the direct assessment is then obtained calculating the weighted average of the chosen CEN courses which are represented by the attainment of their course learning outcomes. The weighted average means the rate of number of students attaining the predefined target in each course over the total number of student in the actual courses.

Indirect Assessment: Stakeholder are asked to rate the quality of teaching and learning process through the conduction of different surveys. The CEN program developed evaluation forms for the stakeholders to guide the evaluation of results obtained from the collected surveys. Table 1 summarizes the tools for the indirect assessment and evaluation of the program learning outcomes. In this regard, formal written surveys targeting the sought outcomes are solicited from students at the end of the CEN courses. The surveys are conducted by the faculty members in their respective classes, graduate student unit or by the program coordinator.

Table 1: Indirect assessment tools of the CEN program

Assessment Tool	Frequency of Assessment	Target Level of Achievement
Employers satisfaction Survey	Year	Fixed yearly in the plan for measuring PLOs
Alumni Survey	Year	
Program Evaluation Survey (Graduating students)	Year	

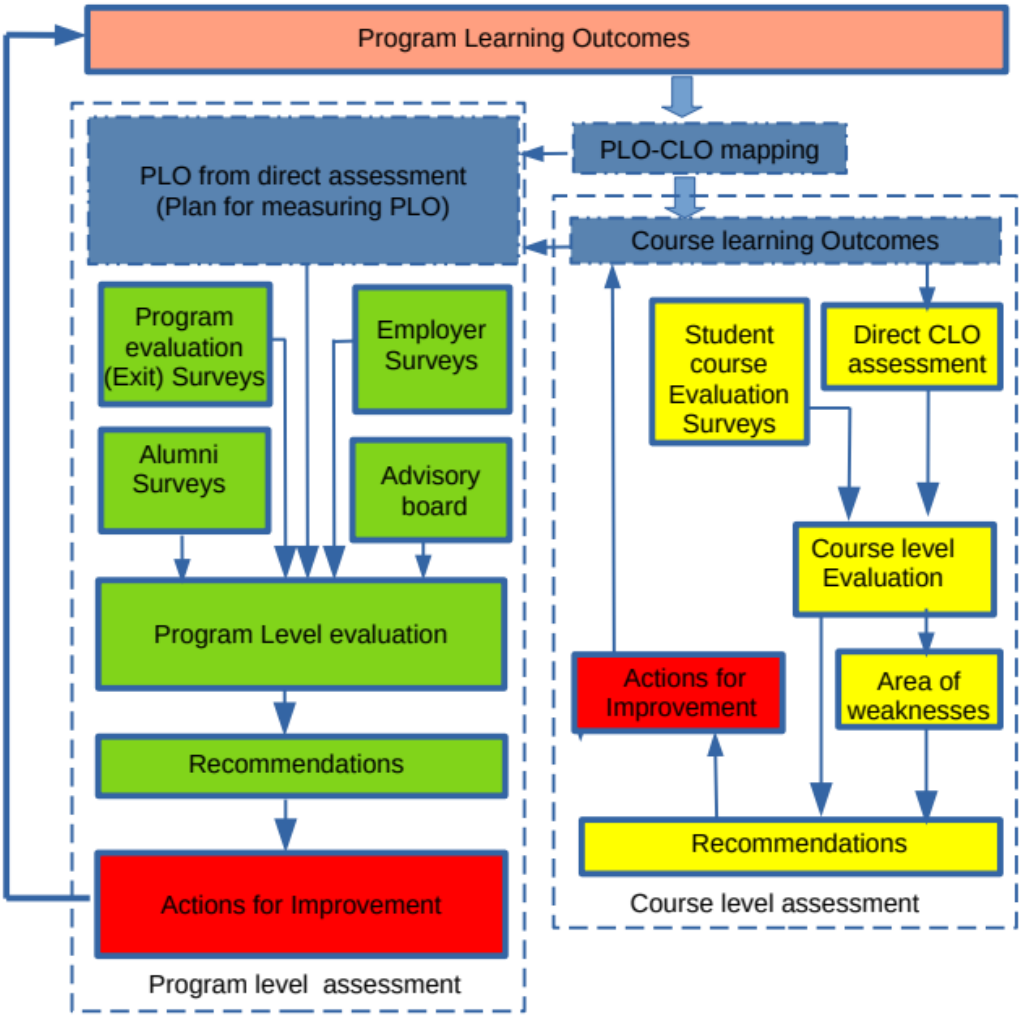

Figure 1: Assessment and evaluation process of the program learning outcomes.

Employer Satisfaction Survey: This survey is designed specifically for students completing the program in order to measure their extent of achievement of the set outcomes intended for the program. Table 2 shows the assignment between the different items in the employer satisfaction surveys to the corresponding program learning outcome. The evaluation level obtained for each item (Question) corresponds to the attainment level of the corresponding PLO.

Table 2: PLO and graduate attributes evaluation from employer satisfaction surveys

Item	Evaluation Item	PLO
knowledge Level		
E.1	Knowledge in the area of expertise	K1
E.2	Problem identification and solving	S3
E.3	Information gathering and analysis	S1
E.4	The ability to apply the learned knowledge	S2
E.5	The ability to use Hi-tech	S5
E.6	Design, implementation and evaluation of computer systems to meet the requirements	S2
Personal aspects.		
E.7	Independent thinking.	V1
E.8	Motivational ability .	V1
E.9	Reliability level.	V2
E.10	Ethics and values	V2
E.11	Adaptation with different environments.	V1
Communication Skills		
E.12	Oral communication.	S4
E.13	Writing reports or research.	S4
E.14	The ability to express ideas.	S4
E.15	Ability to work in a team.	V1

E.16	Administrative leadership.	V1
Job skills		
E.17	Time management.	V1
E.18	Initiative and adventure	V1
E.19	Flexibility and Managing Priorities	V1
Please indicate how important these outcomes are to your employment experience/selection of candidate (direct assessment of the outcomes).		
E.20	Demonstrate sound knowledge of contemporary issues.	K1
E21	Demonstrate sound knowledge of computer engineering and networks issues and problems.	K2
E22	Demonstrate sound knowledge of mathematics, science, and engineering sciences and design	K3
E.23	Design and conduct appropriate experimentation including data collection, analysis, and interpretation, and drawing conclusions.	S1
E.24	Apply engineering design to meet specified needs within realistic constraints such as public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	S2
E.25	Use principles of engineering, science, and mathematics to solve complex engineering problems and to address related research questions.	S3
E.26	Communicate effectively with a range of audiences.	S4
E.27	Use the techniques, skills, and modern engineering tools necessary for computer engineering and networks practices.	S5
E.28	Participate effectively on a team as a member providing leadership, creating collaborative and inclusive environment, establishing goals, planning tasks to meet objectives.	V1
E.29	Recognize ethical and professional responsibilities in	V2

	engineering situations including informed judgments with consideration of global, economic, environmental, and societal contexts.	
E.30	Assess own learning and performance autonomously and engage in independent life-long learning.	V3

For instance the achievement for the PLO S4 according to the employer survey results is given by the following expression:

S4 (from Employer survey) = Average (E.12, E.13, E.14, E.26)

Alumni Survey: The alumni represent a vital part of the CEN program evaluation since they represent its outcome, and their success is a direct reflection of the success of the program itself and the fulfillment of the program goals in providing the community with competent and confident graduates. Table 3 shows the assignment between the different items in the alumni surveys to the corresponding program learning outcome. The evaluation level obtained for each item corresponds to the attainment level of the corresponding PLO.

Table 3: PLO and graduate attributes evaluation from alumni surveys

Item	Evaluation Item	PLO
Qualities_and_Abilities		
A.1	Problem solving skills	S3
A.2	Initiative and enterprise.	V1
A.3	Planning and organizing.	V1
A.4	Personality skills	S4
A.5	Positive attitude	S4
A.6	Reliability and punctuality	V1

A.7	Self-management.	V1
A.8	Willingness to learn	V3
A.9	Flexibility and management of priorities	V1
A.10	Communication.	S4
A.11	Teamwork.	V1
A.12	Technology and Digital Skills	S5
The level of program preparation for you in the following Program Learning Outcomes		
A.13	Demonstrate sound knowledge of contemporary issues.	K1
A.14	Demonstrate sound knowledge of computer engineering and networks issues and problems.	K2
A.15	Demonstrate sound knowledge of mathematics, science, and engineering sciences and design	K3
A.16	Design and conduct appropriate experimentation including data collection, analysis, and interpretation, and drawing conclusions.	S1
A.17	Apply engineering design to meet specified needs within realistic constraints such as public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	S2
A.18	Use principles of engineering, science, and mathematics to solve complex engineering problems and to address related research questions.	S3
A.19	Communicate effectively with a range of audiences.	S4
A.20	Use the techniques, skills, and modern engineering tools necessary for computer engineering and networks practices.	S5
A.21	Participate effectively on a team as a member providing leadership, creating collaborative and inclusive environment, establishing goals, planning tasks to meet objectives.	V1
A.22	Recognize ethical and professional responsibilities in engineering situations including informed judgments with consideration of global, economic, environmental, and societal contexts.	V2

A.23	Assess own learning and performance autonomously and engage in independent life-long learning.	V3

For instance the achievement for the PLO S4 according to the alumni survey results is given by the following expression:

S4 (from Alumni survey) = Average (A.4, A.5, A.10, A.19)

Program evaluation survey:

This survey result provides valuable information on the effectiveness of the program in achieving its outcomes. Furthermore, it reflects the positive and negative aspects of the student's achievements in the program. The questions in the surveys assessed **graduating students**' (or exit students) satisfaction in the whole components of the program and program outputs including knowledge, skills, and competences that they gained, academic and career counseling they have encountered before graduation. Table 4 shows the assignment between the different items in the program evaluation surveys to the corresponding program learning outcome. The evaluation level obtained for each item corresponds to the attainment level of the corresponding PLO.

Table 4: PLO and graduate attributes evaluation from program evaluation surveys

Item	Evaluation Item	PLO
Assistance and support provided to the student:		
Pr.1	I had appropriate academic and professional advising during my studies in the program.	--
Pr.2	The faculty members was available for guidance and advice when I needed to talk to them.	--
Pr.3	The faculty members in the department encouraged me to do my best.	--
Pr.4	The faculty members in the department provided feedback on my work (through midterm exams and quizzes....)	--

Pr.5	The faculty members of the department has a great knowledge of the topic of the courses they teach.	--
Pr.6	The faculty members in the department was enthusiastic about the work.	--
Pr.7	The faculty members paid attention to the progress of their students.	--
Resources for education support:		
Pr.8	The course materials were up-to-date and useful.	--
Pr.9	Library resources were convenient and available whenever I needed them.	--
Pr.10	The facilities of the halls (for lectures, laboratories, and lessons) were of good quality.	--
Pr.11	The computer equipment was sufficient for my needs.	--
Pr.12	Adequate facilities are provided for extracurricular activities (including sports and recreation facilities).	--
Pr.13	There are facilities suitable for religious rituals.	--
Pr.14	The field training programs (or internship year) have been effective in developing my skills.	K1, S2, S4, S5 V1, V2, V3
Evaluation of the education received by the student:		
Pr.15	What I learned in this program (department) will be important for my future.	V3
Pr.16	The program has helped me to develop an interesting effort to keep my knowledge and skills current.	K1
Pr.17	The program has improved my ability to investigate and solve new problems.	S3
Pr.18	The program has improved my ability to work effectively with groups.	V1
Pr.19	The program has improved my communication skills.	S4
Pr.20	The program helped me to develop my fundamental skills for technology deployments (studying issues and analyzing results).	S1, S5

Pr.21	I have developed the knowledge and skills necessary for my chosen profession.	K1, S5
Evaluation of the program learning outcomes		
Pr.22	Demonstrate sound knowledge of contemporary issues.	K1
Pr.23	Demonstrate sound knowledge of computer engineering and networks issues and problems.	K2
Pr.24	Demonstrate sound knowledge of mathematics, science, and engineering sciences and design	K3
Pr.25	Design and conduct appropriate experimentation including data collection, analysis, and interpretation, and drawing conclusions.	S1
Pr.26	Apply engineering design to meet specified needs within realistic constraints such as public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	S2
Pr.27	Use principles of engineering, science, and mathematics to solve complex engineering problems and to address related research questions.	S3
Pr.28	Communicate effectively with a range of audiences.	S4
Pr.29	Use the techniques, skills, and modern engineering tools necessary for computer engineering and networks practices.	S5
Pr.30	Participate effectively on a team as a member providing leadership, creating collaborative and inclusive environment, establishing goals, planning tasks to meet objectives.	V1
Pr.31	Recognize ethical and professional responsibilities in engineering situations including informed judgments with consideration of global, economic, environmental, and societal contexts.	V2
Pr.32	Assess own learning and performance autonomously and engage in independent life-long learning.	V3

For instance the achievement for the PLO S4 according to the program evaluation survey results is given by the following expression:

S4 (from Program evaluation survey) = Average (Pr.14, Pr.19, Pr.29)

Graduate attributes' measurement:

At least, the measurement of the Graduate attributes can be obtained by the averaging of the achievement of the PLOs from direct assessment corresponding to each graduate attribute in Table 5. For instance the attainment of the P1 is obtained by the average of the attainments of K2, K3, S1, S2, S3 and S5 (see Annex for graduate attribute and program learning outcome definitions).

Table 5: Alignments of Graduate Attributes of CEN Program with Program Outcomes

CEN Graduate Attributes	CEN Program Leaning Outcomes
P1.	K2, K3, S1, S2., S3, S5.
P2.	V1.
P3.	V3, K1.
P4.	S4, V2
P5.	S2, S3, V1
P6.	S2.
P7.	

Annex

The Program leaning outcome of the computer engineering and networks program (Improved plan) are listed in the table below:

Table 6: CEN program leaning outcomes with respect to the NQF three domains (Knowledge and understanding, Skills and Values), Improved Plan

Knowledge and understanding	
K1	Demonstrate sound knowledge of contemporary issues.
K2	Demonstrate sound knowledge of computer engineering and networks issues and problems.
K3	Demonstrate sound knowledge of mathematics, science, and engineering sciences and design
Skills	
S1	Design and conduct appropriate experimentation including data collection, analysis, and interpretation, and drawing conclusions.
S2	Apply engineering design to meet specified needs within realistic constraints such as public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
S3	Use principles of engineering, science, and mathematics to solve complex engineering problems and to address related research questions.
S4	Communicate effectively with a range of audiences.
S5	Use the techniques, skills, and modern engineering tools necessary for computer engineering and networks practices.
Values	
V1	Participate effectively on a team as a member providing leadership, creating collaborative and inclusive environment, establishing goals, planning tasks to meet objectives.
V2	Recognize ethical and professional responsibilities in engineering situations including informed judgments with consideration of global, economic, environmental, and societal contexts.
V3	Assess own learning and performance autonomously and engage in independent life-long learning

The graduate attributes of the CEN program (Improved plan) are:

P1. Apply the knowledge of computer engineering and networks in the design of computer-based systems that conform to given specifications and cost constraints, for solving related engineering problems,

P2. Work creatively, cooperatively and responsibly as a member of a professional team,

P3. Independently acquire and apply required information on contemporary computer engineering and networks issues, and become lifelong learners and contributors to the society,

P4. Communicate ideas effectively in written or verbal form, and also adhere to ethical requirement guiding professional engineering practice in a workplace,

P5. Adapt to transition from an academic environment to a career within corporation, organization and entrepreneurial, or research environment.

P6. Adhere to high scientific and societal values and norms and demonstrate commitment to Islamic values.

P7. Engage effectively in serving the community.