**The Mechanisms Used in Program Evaluation Report**

For CS Program

****

**Najran University**

**Computer Science and Information System College**

**List of Abbreviations**

|  |  |
| --- | --- |
| NU | Najran University |
| CSIS | College of Computer Science and Information Systems  |
| CS  | Computer Science  |
| DQU | Development and Quality Unit |
| IQA | Internal Quality Assurance  |
| DDQ | Deanship of Development and Quality  |
| NQF | National Qualification Framework  |
| KPI  | Key Performance Indicator  |
| NCAAA  | National Commission for Academic Accreditation & Assessment |
| QMS  | Quality Management System |
| SWOT | Strengths, Weakness, Opportunities, Threats  |
| COI  | Continuous Quality Improvement  |
| SLOs | Student Learning Outcomes  |
| PAC  | Program Advisory Committee  |
| ABET  | Accreditation Board for Engineering and Technology  |
| DSC  | Department Steering Committee  |
| NQF  | National Qualification Framework  |
| SSRP  | Self-Study Report of Program |
| SES  | Self-Evaluation Scale  |
| SSR  | Self-Study Report  |
| VPDQ  | Vice-President of Development and Quality  |

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| **Introduction:**Excellence in teaching and learning is clearly stated in the university mission that was used to derive the mission of the CS program and the CSIS college. The program of Computer Science (CS) offers high-quality education by hiring qualified faculty members and maintaining a continuous improvement system to ensure the appropriateness of intended learning outcomes and the extent to which they are achieved. Moreover, the performance of teaching staff is evaluated in a regular basis to improve the quality of teaching.  |
| Teaching and learning is a main pillar in the CS program mission which is materialized in a bunch of it activities. It also has strong relation to other pillars of CS mission statement. Consequently, the internal quality system of CS program involves several processes to ensure that teaching and learning activities are valid and result in achieving the stated objectives. These processes can be summarized as follows:-* Internal arrangements are in place to ensure that teaching and learning processes are valid and leading to the achievement of the stated objectives. This includes curriculum committee, courses coordination, rechecking.
* Internal benchmarking: one of the component in the CS program's framework of quality assurance is the internal benchmarking in which its current performance is compared with its past. Definitely teaching and learning in the CS program are the main aspects that are involved in this process.
* International academic reference: as mentioned in the CS program's mission statement the international standard is the main criteria for evaluating the performance of the program in teaching and learning, therefore, the reference to the international academic standards in teaching and learning represent one of the distinctive features of the CS program. In this respect, the program has adopted the ABET learning outcomes as reference for the formulation of the program learning outcomes. Moreover, the design of CS study plan and courses takes into account the recommendations of the several international society specialized in the field of computer science.
* External benchmarking: in the CS framework of quality assurance, the external benchmarking refers to the process of measuring the quality aspects of the program in relative to a similar program at an external university. Among the aspects that should be measured in this process, teaching and learning are given higher priority. In this respect the CS-program has taken several step to carry out this process. This includes the specification of the external CS program that will be used as external benchmark and the specification of the program aspects that are the goal of benchmarking
* Independent review: in the quality framework of CS program, the independent review to verify the quality aspects of the program is given high priority particularly in teaching and learning aspects of the programs. In this respect the CS program has taken the necessary actions to accomplish the independent review step. The nomination of the eternal reviewers, specification of the documents that should be sent to the reviewers, and making the necessary communications and arrangements to accomplish this step.
* Soliciting students’ opinions on the quality of teaching and learning is one of the major sources of information for judging the quality of the CS program. In the quality framework of CS program it is materialized in a form of a set of questionnaires and surveys distributed to the students such as exit survey, alumni survey, current students survey
* Soliciting stakeholders opinions: in addition to program's students as a major source of information on the quality of teaching and learning, information from other stakeholder (faculty members, employers, advisory board ) are solicited through a set of questionnaires , meetings, on the quality of teaching and learning.
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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  **1.1 Student Learning Outcomes:**Describe the processes used for ensuring the appropriateness and adequacy of intended student learning outcomes from the program. Include action taken to ensure consistency of the intended student learning outcomes with professional or occupational employment requirements as indicated by expert advice or requirements of professional bodies or relevant accrediting agencies with the National Qualifications Framework. (Note that evidence on the standards of student achievement of these intended learning outcomes should be considered in sub-standard 4.4 below)During the establishment of Student learning Outcomes (SOs) for Computer Science program, relevant academic and professional advice was considered**.** More Specifically, the process started by considering the latest recommendations of world renowned societies such as IEEE/CS, CSAB, ACM in the computer science area. In addition the requirements of national and international accreditation agencies (NCAAA and ABET) as well as the Saudi National Qualification Framework (NQF) were extensively considered in the formulation of the SOs. Note that SOs are broad statements that describe what students will be able to do and know by the end of the program (time of graduation). In the first semester of academic year (1432/1433) 2011/2012, the Development and Quality Unit (DQU) at the college of Computer Science and Information Systems (CSIS) at Najran University met with all faculty members and discussed the formulation of intended student learning outcomes for the Computer Science program (CS). The department faculty members including male and female gave their opinions through several meetings, discussions and surveys about the proposed SOs. Further, DQU met with students' representatives from the male and female campuses (Male and Female Student Committee) and make the proposed SOs available to them but there have been no major comments on the proposed SOs. In the Second Semester (1432/1433) 2011/2012, the Program Advisory Committee (PAC) including representatives from the public and private industries and professors from other universities reviewed the proposed SOs and gave their opinions through a filled survey. Based on the comments received from the program's stakeholders and after careful review of the requirements of accreditation agencies (NCAAA and ABET) and NQF as well as the recommendations of societies (IEEE/CS, CSAB, ACM), the program, in the academic year 1433/1434 (2012/2013),decided to:* Adopt the ABET a-k CS Student Outcomes (SOs) for the Computer Science program at Najran University (NU).
* Modify the CS curriculum by adding extra courses related to mathematics and sciences to ensure consistency with NCAAA, ABET and NQF.
* Approve that the university Preparatory Year (PY) is part of the CS program because its student learning outcomes are very consistent with the SOs of the CS program. The total credit hours of the CS program including PY (107 + 27 (PY) = 134 credit hours) meets the NQF minimum requirement of 120 credit hours for a bachelor degree.

The NCAAA and NQF identify SLOs (Student Learning Outcomes) in five learning domains: Knowledge, Cognitive Skills, Interpersonal Skills and Responsibility, Communication Information Technology and Numerical, and Psychomotor Skills. It is required that the SOs of a program must be consistent with NQF and covering all of the domains of learning except psychomotor level. However, the ABET a-k CS SOs adopted by our program has no outcomes that belong explicitly to the NCAAA knowledge skills level. Yet, if two learning outcomes have the same contexts with different levels of learning, then we can only consider one learning outcome with the higher level of learning. Assume we have the following outcomes:* Describe a computer-based system or program to meet desired needs;
* Design a computer-based system or program to meet desired needs;

Using the above outcomes, it is acceptable to consider the second outcome because if students are able to design, it is obvious that they are able to describe. Table 4.1 illustrates the SOs of the CS program written in NCAAA learning domains. Our set of SOs is consistent with the NQF learning domains even though we don’t have explicit SOs at the knowledge skills level. The following points justify our choices of having no explicit outcomes at the knowledge level:* Outcomes at the knowledge level have the same contexts as those at the cognitive level. Therefore, if students achieve SOs at the cognitive level, it is obvious that they achieve it at the knowledge level.
* A set of outcomes at the knowledge level is delivered throughout the program (Courses and other strategies) to support the achievements of outcomes at the cognitive level.

ABET a-k CS outcomes are world-wide and are adopted by the best universities (KFUPM and KSU) in Saudi Arabia.Use the below table to ***provide all the program learning outcomes*** required for graduation with the appropriate assessment methods and teaching strategies in alignment. Use the learning outcomes in the NQF domains of learning, assessment methods, and teaching strategies identified in the Program Specifications. If there are no learning outcomes required for the psychomotor domain then omit the fifth learning domain.Table 1.1: SOs of the Computer Science Program

|  |  |  |  |
| --- | --- | --- | --- |
|  | **NQF Learning Domains****and Learning Outcomes** | **Teaching****Strategies** | **Assessment****Methods** |
| **1.0** | **Knowledge** |
|  |  |  |  |
| **2.0** | **Cognitive Skills** |
| 2.1 | An ability to apply knowledge of computing and mathematics appropriate to the program’s student outcomes and to the discipline; | * Lecture: Teacher gives concepts theoretically and by applying those to a real-world case study to be discussed using different examples on different situations.
* Discussions: the teacher gives an idea to students and asks them to give their viewpoints, as well as, their reasoning regarding it.
* Cooperative Learning: Teacher divides students into groups who are given problem-based assignments and homework to be submitted on a specified deadline.
* Student-centered learning should be designed to facilitate the learner in doing, thinking, manipulating, constructing, testing, analyzing and reflecting.
* Organizing the flow of thoughts.
* Increasing teaching efficiency by use of software.
* Participating in tutorial classes and open lab.
* Use more real life examples in the lecture relating to the surroundings of the students to draw attention that certainly helps them to concentrate more on the specific topic. (b-i-3)
* During laboratory hours all concepts of theory are discussed through applying them to a case study. During this discussions between the teacher and students regarding open-ended problems are taking place.
* Website visits.
* Give an assignment that includes critical problem which can be answered by internet search, reading the provided outcome and to analyze it.
* Pick one student who fully understood a specific topic and let him describe in front of the class in his own manner.
* Recall the topics of last lecture and the critical issues based on different topics, which certainly helps students to recall memory frequently and store that topic in their memory for long term.
* Before start a new topic or at the end of each topic, students are given couple of minutes to imagine the real life scenarios relating to that topic including implementation, advantages, deficiencies etc. to improve their logical thinking.
 | **Direct Methods:**1. Course Learning Outcomes assessment (Each Semester)2. Performance Indicators with a set of rubrics (once every assessment cycle)**Indirect Methods:**1. Exit Survey (Each Semester)2. Current Student Survey (Each Semester)3. PAC Meeting and Discussions (Once a Year)4. Alumni Survey5. Employer Survey |
| 2.2 | An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| 2.3 | An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs; |
| 2.4 | An ability to use current techniques, skills, and tools necessary for computing practice; |
| 2.5 | An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the trade-offs involved in design choices; |
| 2.6 | An ability to apply design and development principles in the construction of software systems of varying complexity. |
| **3.0** | **Interpersonal Skills & Responsibility** |
|  | An ability to function effectively on teams to accomplish a common goal; | * Lectures in which students are made aware of the significance of time management. c-ii-2. Creation of interactive teaching and learning environment.
* Discussions with students on ethical behavior in conducting research.
* Quiz competition among groups.
* Individual counseling on assignments, research project and subject matter difficulties.
* Group assignments and discussions where much of the most effective learning comes from the student explaining, discussing and defending her own ideas with his peers.
* Developing the awareness and confidence among students about their interpersonal know how.
* Students’ counseling and advising.
* Making students alert about class attendance, timing, cleanliness and manner inside the class.
* Encouraging a self-critical evaluation of student existing knowledge and behavior pattern in solving problems in classroom.
* During laboratory hours all concepts of theory are discussed through applying them to a case study. During this discussions between the teacher and students regarding open-ended problems are taking place. This strengthens both decisions making skills when choosing among a couple of alternatives and communication skills among them because the teacher is expected **that** all students participate in such discussions.
 | **Direct Methods:**1. Course Learning Outcomes assessment (Each Semester)2. Performance Indicators with a set of rubrics (once every assessment cycle)**Indirect Methods:**1. Exit Survey (Each Semester)2. Current Student Survey (Each Semester)3. PAC Meeting and Discussions (Once a Year)4. Alumni Survey5. Employer Survey |
| 3.2 | An understanding of professional, ethical, legal, security and social issues and responsibilities; |
| 3.3 | An ability to analyses the local and global impact of computing on individuals, organizations, and society; |
| 3.4 | An ability to recognize the need for and to engage in continuing professional development; |
| **4.0** | **Communication, Information Technology, Numerical** |
| 4.1 | An ability to communicate effectively with a range of audiences | * Assigning projects/assignments where students must search the relevant material/resource from internet to finish the task.
* Deliver lectures in a steady pace with a loud voice and clear-perfect pronunciation.
* Ask about different ideas on a specific topic in the lecture.
* Class participation by oral questioning and answering.
* Encourage students to consult the specialist in the computer lab or IT department for help on web-based material.
* Assign research papers that must include analysis of material taken from acceptable web sites.
* Demand the use of power point when giving presentations in specific topics of lectures, assignments, and projects .
* Solving lots of problems in programming and database systems, its performance, and design.
* Require that written homework be typed in proper format.
* Numerical skills assessed during orientation. Special tutorials provided for those in need.
* Assignments include numerical analysis whenever relevant to topic concerned.
* Students will be divided into groups and given programming-based assignments which will help them to work collaboratively, decide independently, and learn more skills to communicate with people.
* During laboratory hours all theoretical concepts are discussed through applying them to a case study. During this discussions between the teacher and students regarding open-ended problems are taking place. This strengthens both decisions making skills when choosing among a couple of alternatives and communication skills among them because the teacher is expected to all students participate in such discussions.
 | **Direct Methods:**1. Course Learning Outcomes assessment (Each Semester)2. Performance Indicators with a set of rubrics (once every assessment cycle)**Indirect Methods:**1. Exit Survey (Each Semester)2. Current Student Survey (Each Semester)3. PAC Meeting and Discussions (Once a Year)4. Alumni Survey5. Employer Survey |

**Describe** the general performance of the program learning outcomes; including external KPIs with benchmarks and analysis assessments from students and employer surveys and a summary of the direct assessment of student learning achievements (How well are the students learning?).As mentioned above the program considered several KPIs to measure the quality of the teaching and learning standard. More specifically, the program uses several direct and indirect assessment methods to evaluate the performance of program learning outcomes. The use of multi-assessment methods to reduce the bias of one assessment method. The data are collected and evaluated separately for each assessment method. Whenever the evaluation results are available for an assessment method, an improvement plan should be prepared. Note that improvement plan might affect any aspect of the program.In the following sub-section, we will explain in details our student learning outcome assessment system. The following tables illustrate the general performance of the student learning outcomes including analysis of data collected from various stakeholders (students, employers, etc.):**1. General Performance of Student Learning Outcomes Using Direct Assessment Methods:****1.1 Assessment of student learning outcomes using course learning outcomes**The following table (Table 1.2) illustrates the attainment of Student Learning Outcomes (SOs) using the assessment of Course Learning Outcomes in the academic year 2015/2016.The idea behind this method is that all courses are mapped to the appropriate student outcomes by relating CLOs of all courses to SOs. Mapping courses to SOs ensures that all SOs are addressed by several courses at different levels in the program. In addition, this will help us to know if student outcomes have not been met at a particular course. The assessment of SOs using CLOs assessment each semester supports us to maintain a semester-based continuous improvement by using the achievements of CLOs. The expected performance is 65% for each SO. Note that courses that are related to a specific SO have equal contribution. For instance, several SOs are not achieved (2.1, 2.2, 2.3, etc.).Figure 1.1 illustrates graphical representation of SOs using CLOs in the academic year 2015/2016.**1. General Performance of Student Learning Outcomes Using Direct Assessment Methods:****1.1 Assessment of student learning outcomes using course learning outcomes**The following table (Table 1.2) illustrates the attainment of Student Learning Outcomes (SOs) using the assessment of Course Learning Outcomes in the academic year 2015/2016.The idea behind this method is that all courses are mapped to the appropriate student outcomes by relating CLOs of all courses to SOs. Mapping courses to SOs ensures that all SOs are addressed by several courses at different levels in the program. In addition, this will help us to know if student outcomes have not been met at a particular course. The assessment of SOs using CLOs assessment each semester supports us to maintain a semester-based continuous improvement by using the achievements of CLOs. The expected performance is 65% for each SO. Note that courses that are related to a specific SO have equal contribution. For instance, several SOs are not achieved (2.1, 2.2, 2.3, etc.).Figure 1.1 illustrates graphical representation of SOs using CLOs in the academic year 2015/2016.Table 1.2: Achievements of SOs using CLOs assessment Achievements

|  |  |
| --- | --- |
| No | **NQF Learning Domains****and Learning Outcomes** |
| **1.0** | **Knowledge** |  |
|  |  |
| **2.0** | **Cognitive Skills** | **First Semester 2015/2016** | **Second Semester 2015/2016** | **2015/2016** |
| **Male** | **Female** | **Male** | **Female** | **Overall Evaluation** |
| 2.1 | An ability to apply knowledge of computing and mathematics appropriate to the program’s student outcomes and to the discipline; | **56.02** | **73.35** | **47.26** | **70.32** | **61.7375** |
| 2.2 | An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; | **54.49** | **67.04** | **57.29** | **69.07** | **61.9725** |
| 2.3 | An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs; | **47.71** | **65.2** | **43.64** | **68.04** | **56.1475** |
| 2.4 | An ability to use current techniques, skills, and tools necessary for computing practice; | **49.3** | **63.98** | **37.78** | **65.2** | **54.065** |
| 2.5 | An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the trade-offs involved in design choices; | **54.7** | **67.6** | **47.88** | **67.84** | **59.505** |
| 2.6 | An ability to apply design and development principles in the construction of software systems of varying complexity. | **51.67** | **68.44** | **53.16** | **70.46** | **60.9325** |
| **3.0** | **Interpersonal Skills & Responsibility** | **First Semester 2015/2016** | **Second Semester 2015/2016** | **2015/2016** |
| **Male** | **Female** | **Male** | **Female** | **Overall Evaluation** |
| 3.1 | An ability to function effectively on teams to accomplish a common goal; | **00** | **83** | **65** | **100** | **62** |
| 3.2 | An understanding of professional, ethical, legal, security and social issues and responsibilities; | **57.78** | **75** | **23.16** | **66.92** | **55.715** |
| 3.3 | An ability to analyze the local and global impact of computing on individuals, organizations, and society; | **83.5** | **00** | **12.5** | **85.1** | **45.275** |
| 3.4 | An ability to recognize the need for and to engage in continuing professional development; | **46.3** | **77.68** | **35.52** | **80.35** | **59.9625** |
| **4.0** | **Communication, Information****Technology, Numerical** | **First Semester 2015/2016** | **Second Semester 2015/2016** | **2015/2016** |
| **Male** | **Female** | **Male** | **Female** | **Overall Evaluation** |
| 4.1 | An ability to communicate effectively with a range of audiences | **65** | **92.31** | **50** | **87.5** | **73.7025** |

Figure 1.1: Student outcomes Achievements using CLOs achievements for the academic year 2015/2016

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1.2 Evaluation of SOs using Performance Indicators (PIs), Embedded Questions and Rubrics**This is our second assessment method to evaluate the attainment of SOs. A set of Performance Indicators were developed for each one of the SOs. PIs are then aligned to the curriculum to facilitate the collection of data. Data are then evaluated by using a set of rubrics. In this method, we collect data and evaluate each SO once in a complete assessment cycle (2-3 years). We already evaluated all SOs using rubrics in the First and Second Semesters 2012/2013 and First Semester 2013-2014. The general performance of SOs are shown below in Table 1.3:Table 1.3: Evaluation Results of SOs using Rubric Performance Indicators Results

|  |  |
| --- | --- |
| **No** | **NQF Learning Domains****and Learning Outcomes** |
| **1.0** | **Knowledge** |  |
|  |  |
| **2.0** | **Cognitive Skills** | **Percentage of Performance** | **Number of Students** | **Source of Data** | **Time of Data Collection** |
| **2.1** | **An ability to apply knowledge of computing and mathematics appropriate to the discipline** | **87.7%** |  |  |  |
| PI 2.1.1 | Choose various algorithms used in computing to solve problem | 72.7% | 33 | 212CSS-3361CSS-3 | First Semester 2012/2013 |
| PI 2.1.2 | Demonstrate knowledge of computing and mathematics to solve problems | 94.3% | 35 | 281CSS-3474CSS-3 | First Semester 2012/2013 |
| PI 2.1.3 | Illustrate the mathematical concepts that underlies computing | 92% | 50 | 235CSS-3474CSS-3 | First Semester 2012/2013 |
| PI 2.1.4 | Use various techniques and approaches of different components  in computing. | 91.7% | 12 | 342CSS-2429CSS-3 | First Semester 2012/2013 |
| **2.2** | **An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution** | **49.4%** |  |  |  |
| PI 2.2.1 | Breakdown a given problem into smaller components | 53.5% | 58 | 113CSS-4212CSS-3 | First Semester 2012/2013 |
| PI 2.2.2 | Identify tools, techniques and models to achieve the solution. | 48.7% | 39 | 330CSS-3380CSS-3 | First Semester 2012/2013 |
| PI 2.2.3 | Define the requirements for a given computing problem | 46% | 37 | 330CSS-3380CSS-3 | First Semester 2012/2013 |
| **2.3** | **An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs.** | 69.75% |  |  |  |
| PI 2.3.1 | Design a computer-based system, process, component or program | 86.67% | 30 | 474CSS-3342CSS-3 | Second Semester 2012/2013 |
| PI 2.3.2 | Implement a computer-based system, process, component or program | 38.71% | 31 | 111CSS-4340CSS-3 | Second Semester 2012/2013 |
| PI 2.3.3 | Test and evaluate a computer based system, process, component or program | 83.33% | 66 | 113CSS -4457CSS -3 | Second Semester 2012/2013 |
| **3.0** | **Interpersonal Skills & Responsibility** | **Percentage of Performance** | **Number of Students** | **Source of Data** | **Time of Data Collection** |
| **3.1** | **An ability to function effectively on teams to accomplish a common goal** | 82.87% |  |  |  |
| PI 3.1.1 | Share knowledge and ideas to achieve a common goal. | 74.3% | 105 | 491CSS-4492CSS-4 | Second Semester 2012/2013 |
| PI 3.1.2 | Adhere to team responsibilities to achieve a common goal. | 84.8% | 105 | 491CSS-4492CSS-4 | Second Semester 2012/2013 |
| PI 3.1.3 | Listen to other team members. | 89.5% | 105 | 491CSS-4492CSS-4 | Second Semester 2012/2013 |
| **3.2** | **An understanding of professional, ethical, legal, security and social issues** | **78.3%** |  |  |  |
| PI 3.2.1 | Demonstrate an understanding of professional and ethical issue | 84% | 19 | 440CSS-3 | Second Semester 2012/2013 |
| PI 3.2.2 | Describe legal and social issues | 82% | 46 | 342CSS-3440CSS-3 | Second Semester 2012/2013 |
| PI 3.2.3 | Demonstrate an understanding of IT security issues | 68.9% | 58 | 227CSS-3457CSS-3 | Second Semester 2012/2013 |
| **4.0** | **Communication, Information Technology, Numerical** | **Percentage of Performance** | **Number of Students** | **Source of Data** | **Time of Data Collection** |
| **4.1** | **An ability to communicate effectively with a range of audiences.** | **92.72%** |  |  |  |
| PI 4.1.1 | Prepare scientific report | 92% | 9 | 491CSS-4492CSS-4 | First Semester 2012/2013 |
| PI 4.1.2 | Present scientific accomplishment verbally | 92.4% | 9 | 491CSS-4492CSS-4 | First Semester 2012/2013 |
| PI 4.1.3 | Utilize presentation skills and technology | 93.75% | 9 | 491CSS-4492CSS-4 | First Semester 2012/2013 |
| **3.0** | **Interpersonal Skills & Responsibility** | **Percentage of Performance** | **Number of Students** | **Source of Data** | **Time of Data Collection** |
| **3.3** | **An ability to analyze the local and global impact of computing on individuals, organizations and society** | **55.37%** |  |  |  |
| PI 3.3.1 | Analyze the local and global IT situation, challenges and opportunities. | 61.1% | 18 | 440CSS-3456CSS-3 | First Semester 2013/2014 |
| PI 3.3.2 | Examine the effect of IT on local society, individual and organization. | 65% | 20 | 361CSS-3440CSS-3342CSS-3 | First Semester 2013/2014 |
| PI 3.3.3 | Investigate the effect of globalization and IT on society and individuals. | 40% | 5 | 361CSS-3429CSS-3 | First Semester 2013/2014 |
| **3.4** | **An ability to recognize the need for and to engage in continuing professional development** | 64.12% |  |  |  |
| PI 3.4.1 | Recognize the importance of continuing professional development | 82.10% | 39 | 491CSS-4492CSS-4 | Second Semester 2012/2013 |
| PI 3.4.2 | Demonstrate the use of professional development skills. | 71.79% | 39 | 491CSS-4492CSS-4 | Second Semester 2012/2013 |
| PI 3.4.3 | Participate in professional development activities. | 38.46% | 39 | 491CSS-4492CSS-4 | Second Semester 2012/2013 |
| **2.0** | **Cognitive Skills** | **Percentage of Performance** | **Number of Students** | **Source of Data** | **Time of Data Collection** |
| **2.4** | **An ability to use current techniques, skills, and tools necessary for computer practice** | 78.86% |  |  |  |
| PI 2.4.1 | Apply current technique(s) to solve a real life problem. | 78.05% | 82 | 113CSS-4342CSS-3380CSS-3 | First Semester 2012/2013 |
| PI 2.4.2 | Use current skills to conduct computing tasks | 77.27% | 66 | 111CSS-4329CSS-3 | First Semester 2012/2013 |
| PI 2.4.3 | Practice current tools to accomplish computational tasks | 81.25% | 48 | 281CSS-3457CSS-3222CSS-3 | First Semester 2012/2013 |
| **2.5** | **An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modelling and design of computer-based systems in a way that demonstrates comprehension of the trade-offs involved in design choices** | **66.04%** |  |  |  |
| PI 2.5.1 | Apply math foundations in the modelling and design of computer-based systems | 75.76% | 25 | 281CSS-3429CSS-3 | First Semester 2013/2014 |
| PI 2.5.2 | Apply algorithmic principles in the modelling and design of computer-based systems | 51.92% | 27 | 212CSS-3474CSS-3 | First Semester 2013/2014 |
| PI 2.5.3 | Apply computer science theory in the modelling and design of computer-based systems | 70.45% | 31 | 281CSS-3222CSS-3 | First Semester 2013/2014 |
| **2.6** | **An ability to apply design and development principles in the construction of software systems of varying complexity** | 81.38% |  |  |  |
| PI 2.6.1 | Illustrate design principle in the construction of software systems | 78.13% | 32 | 212CSS-3342CSS-3 | First Semester 2013/2014 |
| PI 2.6.2 | Construct development principles in the making of software systems | 84.62% | 39 | 342CSS-3457CSS-3380CSS -3 | First Semester 2013/2014 |

**2. General Performance of Student Learning Outcomes Using Indirect Assessment Methods:****2.1 Exit Survey**: This survey is filled-up by all students at the time of graduation. Table 1.4 illustrates the analysis results of the exit survey conducted in the Second Semester 2015/2016 about the student learning outcomes of the CS program (Male & Female). The percentage of achievement is the percentage of students who answered strongly agrees or agrees.Table 1.4: SOs Analysis Results of the Exit Survey

|  |  |
| --- | --- |
| No | **NQF Learning Domains****and Learning Outcomes** |
| **1.0** | **Knowledge** |  |
|  |  |
| **2.0** | **Cognitive Skills** | Second Semester 2015/2016 | Overall Percentage of Achievement |
| MaleNumber of Respondents: 11 | FemaleNumber of Respondents: 03 |
| 2.1 | An ability to apply knowledge of computing and mathematics appropriate to the program’s student outcomes and to the discipline; | 59.10% | 33.33% | 46.21% |
| 2.2 | An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; | 48.48% | 44.44% | 46.46% |
| 2.3 | An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs; | 63.64% | 66.66% | 65.15% |
| 2.4 | An ability to use current techniques, skills, and tools necessary for computing practice; | 63.64% | 33.33% | 48.50% |
| 2.5 | An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the trade-offs involved in design choices; | 00.00% | 33.33% | 16.66% |
| 2.6 | An ability to apply design and development principles in the construction of software systems of varying complexity. | 63.64% | 33.33% | 48.50% |
| **3.0** | **Interpersonal Skills &Responsibility** | Second Semester 2015/2016 | Overall Percentage of Achievement |
| MaleNumber of Respondents: 11 | FemaleNumber of Respondents: 03 |
| 3.1 | An ability to function effectively on teams to accomplish a common goal; | 63.64% | 100.00% | 81.82% |
| 3.2 | An understanding of professional, ethical, legal, security and social issues and responsibilities; | 60.61% | 77.77% | 69.19% |
| 3.3 | An ability to analyse the local and global impact of computing on individuals, organizations, and society; | 66.66% | 77.77% | 72.22% |
| 3.4 | An ability to recognize the need for and to engage in continuing professional development; | 54.55% | 66.66% | 60.61% |
| **4.0** | **Communication, Information****Technology, Numerical** | Second Semester 2015/2016 | Percentage of Achievement |
| MaleNumber of Respondents: 11 | MaleNumber of Respondents: 11 |
| 4.1 | An ability to communicate effectively with a range of audiences | 60.61% | 88.88% | 74.75% |

**2.2Program Advisory Committee (PAC) Discussion and Survey:**The DQU meets once a year with the PAC to evaluate the importance of SOs to ensure that the outcomes are still in-line with the dynamic needs of the industry. Table 1.5 shows the evaluation results of SOs using the opinions of PAC in the meeting held in June 2013. Another PAC meeting held in September 2014 and 2017 but the result was not analyzed yet.Table 1.5: Evaluation Results about the importance of SOs using opinions of PAC

|  |  |
| --- | --- |
| No | **NQF Learning Domains****and Learning Outcomes** |
| **1.0** | **Knowledge** |  |
|  |  |
| **2.0** | **Cognitive Skills** | Importance of Student Outcomes (SOs)June 2013Number of Members is 8 |
| 2.1 | An ability to apply knowledge of computing and mathematics appropriate to the program’s student outcomes and to the discipline; | 85% |
| 2.2 | An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; | 100 % |
| 2.3 | An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs; | 100% |
| 2.4 | An ability to use current techniques, skills, and tools necessary for computing practice; | 100% |
| 2.5 | An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the trade-offs involved in design choices; | 87% |
| 2.6 | An ability to apply design and development principles in the construction of software systems of varying complexity. | 100% |
| **3.0** | **Interpersonal Skills & Responsibility** | Importance of Student Outcomes (SOs)June 2013Number of Members is 8 |
| 3.1 | An ability to function effectively on teams to accomplish a common goal; | 100% |
| 3.2 | An understanding of professional, ethical, legal, security and social issues and responsibilities; | 100% |
| 3.3 | An ability to analyze the local and global impact of computing on individuals, organizations, and society; | 63% |
| 3.4 | An ability to recognize the need for and to engage in continuing professional development; | 87% |
| **4.0** | **Communication, Information****Technology, Numerical** | Importance of Student Outcomes (SOs)June 2013Number of Members is 8 |
| 4.1 | An ability to communicate effectively with a range of audiences | 100% |

**2.3Current Student Survey :**The current students give their opinions about current SOs and educational practices and activities (e.g. academic advising, teaching, etc.) of the program through the Current Student Survey The current student survey is conducted once a year. Table 1.6 illustrates the analysis of the opinions of current students about the SOs. The percentage of achievement is the percentage of students who answered Agree or Strongly Agree in the corresponding questions. The data was collected in the second semester 2015/2016 from both campuses (Male and Female).Table 1.6: Evaluation Results of the SOs using the Current Student Survey Data

|  |  |
| --- | --- |
| No | **NQF Learning Domains****and Learning Outcomes** |
| **1.0** | **Knowledge** |  |
|  |  |
| **2.0** | **Cognitive Skills** | Second Semester 2015/2016 | Overall Percentage of Achievement |
| MaleNumber of Respondents: 07 | FemaleNumber of Respondents: 37 |
| 2.1 | An ability to apply knowledge of computing and mathematics appropriate to the program’s student outcomes and to the discipline; | 57.15% | 56.76% | 56.96% |
| 2.2 | An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; | 61.11% | 56.76% | 58.94% |
| 2.3 | An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs; | 33.33% | 57.66% | 45.50% |
| 2.4 | An ability to use current techniques, skills, and tools necessary for computing practice; | 39.00% | 46.85% | 42.93% |
| 2.5 | An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the trade-offs involved in design choices; | 00.00% | 52.25% | 26.13% |
| 2.6 | An ability to apply design and development principles in the construction of software systems of varying complexity. | 33.33% | 56.76% | 45.00% |
| **3.0** | **Interpersonal Skills &Responsibility** | Second Semester 2015/2016 | Overall Percentage of Achievement |
| MaleNumber of Respondents: 07 | FemaleNumber of Respondents: 37 |
| 3.1 | An ability to function effectively on teams to accomplish a common goal; | 50.00% | 55.86% | 52.88% |
| 3.2 | An understanding of professional, ethical, legal, security and social issues and responsibilities; | 61.11% | 54.05% | 57.58% |
| 3.3 | An ability to analyze the local and global impact of computing on individuals, organizations, and society; | 33.33% | 54.05% | 43.69% |
| 3.4 | An ability to recognize the need for and to engage in continuing professional development; | 50.50% | 53.15% | 51.83% |
| **4.0** | **Communication, Information****Technology, Numerical** | Second Semester 2015/2016 | Overall Percentage of Achievement |
| MaleNumber of Respondents: 07 | FemaleNumber of Respondents: 37 |
| 4.1 | An ability to communicate effectively with a range of audiences | 44.45% | 55.86% | 50.16% |

**2.4 Alumni and Employer Surveys:**SOs outcomes are mapped to Program Educational Objectives (PEOs). Broad statements that describe what students will be able to do after few years of graduations. The alumni of the program and their employers give their opinions several aspects in the program such as curriculum, facilities, SOs through questions related to PEOs statements, etc. Table 1.7 illustrates the mapping of SOs to PEOs. The alumni and employer survey are conducted once a year. Table 1.8 shows the evaluation results of SOs and PEOs using the alumni and employer opinions collected in the First Semester 2013/2014.Table 1.7: Mapping SOs to PEOs

|  |  |
| --- | --- |
| No | **NQF Learning Domains****and Learning Outcomes** |
| **1.0** | **Knowledge** |  |
|  |  |
| **2.0** | **Cognitive Skills** | PEO\_1:Join successful profession in the fields of computing | PEO\_2:Follow-up life-long learning in the course of higher education, research and professional development. | PEO\_3:Contribute significantly to community as a part of a team or individually with accountable, legal, ethical and responsible practices. |
| 2.1 | An ability to apply knowledge of computing and mathematics appropriate to the program’s student outcomes and to the discipline; | √ | √ | √ |
| 2.2 | An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; | √ | √ |  |
| 2.3 | An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs; | √ | √ |  |
| 2.4 | An ability to use current techniques, skills, and tools necessary for computing practice; | √ | √ |  |
| 2.5 | An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the trade-offs involved in design choices; | √ | √ |  |
| 2.6 | An ability to apply design and development principles in the construction of software systems of varying complexity. | √ | √ |  |
| **3.0** | **Interpersonal Skills & Responsibility** | PEO\_1:Join successful profession in the fields of computing | PEO\_2:Follow-up life-long learning in the course of higher education, research and professional development. | PEO\_3:Contribute significantly to community as a part of a team or individually with accountable, legal, ethical and responsible practices. |
| 3.1 | An ability to function effectively on teams to accomplish a common goal; | √ | √ | √ |
| 3.2 | An understanding of professional, ethical, legal, security and social issues and responsibilities; |  |  | √ |
| 3.3 | An ability to analyze the local and global impact of computing on individuals, organizations, and society; |  |  | √ |
| 3.4 | An ability to recognize the need for and to engage in continuing professional development; | √ | √ |  |
| **4.0** | **Communication, Information****Technology, Numerical** | PEO\_1:Join successful profession in the fields of computing | PEO\_2:Follow-up life-long learning in the course of higher education, research and professional development. | PEO\_3:Contribute significantly to community as a part of a team or individually with accountable, legal, ethical and responsible practices. |
| 4.1 | An ability to communicate effectively with a range of audiences |  | √ | √ |

Table 1.8 shows the achievements of PEOs and SOs using opinions of Alumni (5 alumni only). PEO\_2 and PEO\_3 are above the target (75 %). But improvement plan must be prepared and implemented according for the first PEO\_1. Table 1.9 shows the achievements of SOs using the opinion of alumni about PEOs. According to the alumni survey, all SOs have met the target (75%). The data collected from the alumni in the first semester 2013/2014.Table 1.8: Achievements of PEOs using Alumni Survey Results

|  |  |
| --- | --- |
| Program Educational Objectives | Achievement Results Using Alumni Survey (5 Responses) |
| PEO\_1:Join successful profession in the fields of computing | 60% |
| PEO\_2:Follow-up life-long learning in the course of higher education, research and professional development. | 90% |
| PEO\_3:Contribute significantly to community as a part of a team or individually with accountable, legal, ethical and responsible practices. | 80% |
| **Overall Achievement** | **76.66%** |

Table 1.9: Achievements of SOs using PEOs Achievements

|  |  |
| --- | --- |
| No | **NQF Learning Domains****and Learning Outcomes** |
| **1.0** | **Knowledge** |  |
|  |  |
| **2.0** | **Cognitive Skills** | SOs Achievements Using PEOs Evaluation |
| 2.1 | An ability to apply knowledge of computing and mathematics appropriate to the program’s student outcomes and to the discipline; | 76.66% |
| 2.2 | An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; | 75% |
| 2.3 | An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs; | 75% |
| 2.4 | An ability to use current techniques, skills, and tools necessary for computing practice; | 75% |
| 2.5 | An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the trade-offs involved in design choices; | 75% |
| 2.6 | An ability to apply design and development principles in the construction of software systems of varying complexity. | 75% |
| **3.0** | **Interpersonal Skills & Responsibility** | SOs Achievements Using PEOs Evaluation |
| 3.1 | An ability to function effectively on teams to accomplish a common goal; | 76.66 |
| 3.2 | An understanding of professional, ethical, legal, security and social issues and responsibilities; | 80% |
| 3.3 | An ability to analyze the local and global impact of computing on individuals, organizations, and society; | 80% |
| 3.4 | An ability to recognize the need for and to engage in continuing professional development; | 75% |
| **4.0** | **Communication, Information****Technology, Numerical** | SOs Achievements Using PEOs Evaluation |
| 4.1 | An ability to communicate effectively with a range of audiences | 80% |

**Reasons of Contradiction from one assessment methods to another:**We noticed that the achievement levels of SOs differ from one assessment to another. This is due to the following factors; 1) Number and type of cohort of students used in the evaluation 2) misunderstand of teaching staff about the assessment methods 3) responses of students to surveys are not appropriate, etc. However, the evaluation results from several source of methods support us to improve the program in many aspects (evaluation, teaching strategies, qualification teachers, etc.).Based on the evaluation results (Table 1.1 to 1.9), we can conclude that the general performance of the student learning outcomes differ from one assessment methods to another. However, if we take the average performance from all assessment methods except PAC opinions, we can say that the achievements of SOs meet our target for performance **(KPI: Level of attainment for each student's outcomes is 65%)**. Table 1.10 illustrates the general performance of each one of the SOs.Table 1.10: Illustrates the general performance of each one of the SOs

|  |  |
| --- | --- |
| **No** | **NQF Learning Domains****and Learning Outcomes** |
| **1.0** | **Knowledge** |
|  |  |  |
| **2.0** | **Cognitive Skills** | Evaluation of CLOs | PIs using Rubrics | Exit Survey | Current Survey | Alumni Survey | Overall Evaluation |
| 2.1 | An ability to apply knowledge of computing and mathematics appropriate to the program’s student outcomes and to the discipline; | 61.7375 | 87.7% | 46.21% | 56.96% | 76.6% | 65.84% |
| 2.2 | An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; | 61.97% | 49.4% | 46.46% | 58.94% | 75% | 58.35% |
| 2.3 | An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs; | 56.14% | 69.75% | 65.15% | 45.50% | 75% | 62.31% |
| 2.4 | An ability to use current techniques, skills, and tools necessary for computing practice; | 54.06% | 78.86% | 48.50% | 42.93% | 75% | 59.87% |
| 2.5 | An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the trade-offs involved in design choices; | 59.50% | 66.04% | 16.66% | 26.13% | 75% | 48.67% |
| 2.6 | An ability to apply design and development principles in the construction of software systems of varying complexity. | 60.93% | 81.38% | 48.50% | 45.00% | 75% | 62.16% |
| **3.0** | **Interpersonal Skills & Responsibility** | Evaluation of CLOs | PIs using Rubrics | Exit Survey | Current Survey | Alumni Survey | Overall Evaluation |
| 3.1 | An ability to function effectively on teams to accomplish a common goal; | 62.00% | 82.87% | 81.82% | 52.88% | 76.66 | 71.25% |
| 3.2 | An understanding of professional, ethical, legal, security and social issues and responsibilities; | 55.71% | 78.3% | 69.19% | 57.58% | 80% | 68.16% |
| 3.3 | An ability to analyze the local and global impact of computing on individuals, organizations, and society; | 45.27% | 55.37% | 72.22% | 43.69% | 80% | 59.31% |
| 3.4 | An ability to recognize the need for and to engage in continuing professional development; | 59.96% | 64.12% | 60.61% | 51.83% | 75% | 62.30% |
| **4.0** | **Communication, Information****Technology, Numerical** | Evaluation of CLOs | PIs using Rubrics | Exit Survey | Current Survey | Alumni Survey | Overall Evaluation |
| 4.1 | An ability to communicate effectively with a range of audiences | 73.70% | 92.72% | 74.75% | 50.16% | 80% | 74.27% |

 |
| ***Describe*** *the program learning outcome assessment system (What is it?); including the results and analysis for the last four years, a description of the leaders, faculty, committees and responsibilities and the names people who serve on each committee.*In this subsection, we explain in details what the program learning outcome assessment system is. It is a continuous improvement system that ensures regular assessment and evaluation to which program educational objectives, SOs and Course learning outcomes are being attained. In other words, learning outcomes are measure before, after and at the time of graduations. Figure 1.2 shows the high level continuous improvement process (Program learning outcome assessment system) for the Computer Science (CS) program.Figure 1.2: Program Learning Outcome Assessment SystemAs we can see in Figure 1.2, the Program Educational Objectives (PEOs) and Student Outcomes (SOs) and Course Learning Outcomes are assessed and evaluated regularly to improve the learning outcomes and the quality of the program. More specifically, department faculty members collect data from various sources (courses, surveys, discussions, etc.) and prepare them for evaluation. Then, the collected data are evaluated and analyzed by the appropriate departmental committees and the results of evaluation are presented to various stakeholders for approval. The approved improvements will then be implemented to ensure a systematic quality assurance system. Figure 1.3 shows another representation of Program Learning Outcome assessment system.Figure 1.3: Assessment of Program Learning OutcomeThe CS program built a continuous improvement system (Program Learning Outcome Assessment System) that consists of the following major steps:1. Assessment Planning: In this step, we identify the assessment methods to be used and when and by whom data will be collected and how data will be used to assess and evaluate PEOs, SOs and CLOs. Assessment plans to assess and evaluate SOs and PEOs were developed by the Development and Quality Unit (DQU) in the college with consultation of the Department Steering Committee (DSC) and Curriculum Committee (CC).
2. Design and Conduct Assessments: at this step, the assessment methods (e.g. exams, presentation, surveys, etc.) are designed and data are collected and prepared to evaluate the attainment of SOs and PEOs as well as CLOs. Faculty members are mainly involved in this process.
3. Evaluation (Data Collection Analysis): it is one or more processes for interpreting the data and evidence accumulated through assessment processes. Evaluation determines the extent to which CLOs and student outcomes and program educational objectives are being attained. Evaluation results in decisions and actions regarding program improvement. More details will be provided in the subsequent sections.
4. Data Reporting and Improvement Planning: The CS department prepares findings of the evaluation results and improvement plan that address the following points:
	1. What you are assessing?
	2. Who was the cohort of students?
	3. How many students in the cohort?
	4. When did you collect the evidence?
	5. What are the results?
	6. What changes were made or actions did you take?
	7. What difference did they make?
	8. What actions/improvements must be taken?
	9. Who will implement the improvements?
5. Implementation of Improvements: closing the loop (Take Action) is critical to creating and maintaining a systematic quality assurance system. When all approved improvements are successfully implemented, all elements of the quality assurance process interact with one another. We will describe some actions that have been taken to improve the quality of the program especially student learning outcomes.

The evaluation results of the data collected in the previous years are depicted in Table 1.1-1.9. The members of the Department Steering Committee (DSC) and curriculum committee with the support of other committees (Public Relation Committee PRC, etc.) are responsible on the assessment and evaluation of program learning outcomes. In the following sub-section, we will explain in more details the process for the complete assessment system. Table 4.8 summarizes our continuous improvement system including description of the leaders and coordinators, responsibilities of committees and people, frequency. and how the results are evaluated.Table 1.11 describes the involvement of faculty members (Male & Female) and other stakeholders in the assessment of program learning outcomes and the description of responsibilities and roles of committees. Table 1.11 and 1.12 show that all faculty members (Male & Female) are involved in the assessment and evaluation of SOs through course learning outcomes assessment, assessment committees, assessment groups, etc.Table 1.11: People or committee involvement in the assessment of SOs

|  |  |  |
| --- | --- | --- |
| People or committee | Responsibilities in the Assessment of Student Outcomes | Description |
| Development and Quality Unit (DQU) | Development and Quality Unit manages and controls all activities related to quality assurance in the college as well as preparation of national and international accreditation. | The head of DQU is appointed by the chancellor of the University for two years. The current head of DQU is Dr. Mohammed Al Shargabi |
| Department Steering Committee (DSC) | DSC is the heart of the continuous improvement system (assessment system of SOs):1. Prepare assessment plan.
2. Assign people to collect data through surveys and analysed.
3. Report out about the progress of committees and faculty members with respect to SOs assessment.
4. Control and manage the evaluation of SOs using several assessment methods.
5. Send report about SOs achievements to CC for revision.
6. Designate Assessment Coordinators to be responsible for SO assessment.
7. Oversight the progress of all committees related to quality assurance work.
8. Prepare the annual plan and report.
9. Responsible to prepare the first three standards of NCAAA.
 | DSC controls the progress of all committees especially those who are involved in the assessment of SOs. The following people are the members of DSC:1. Dr. Abdullah Alabas (Dean of the College)
2. Dr. Mohammed Al Shargabi (Head of DQU)
3. Dr. Anwar Ali (Coordinator of DQU at the program level)
4. Dr. Zakaria Toukal (Program's Coordinator)
5. Mr. Shah Masud
6. Mrs GulashanArah
7. Mrs. Dalal Al Qhahtani
 |
| Coordinator of DQU at the Program level | He/she is a member of the DSC. He is responsible to make sure that all activities related to quality assurance are carried in the proper way. | DQU's coordinator at the program is assigned by the program council and college councils. Currently, Dr. Anwar Ali Esmail is the coordinator of DQU at the CS program. |
| Curriculum Committee (CC) | The curriculum committee (CC) is responsible to do the following:1. Prepare report about the achievements of SOs using CLOs assessment data.
2. Form SOs groups to evaluate the attainment of SOs using PIs and Rubrics.
3. Review and approve improvements related to program learning outcomes and curriculum.
4. Review and discuss evaluation results of SOs.
 | The members (Male & Female) of the CC are high qualified and expert people in the program. In general, CC must review and approve all issues related to the curriculum and learning outcomes. |
| Coordinators of Courses  | 1. Review and approve course syllabus.
2. Consistency of course delivery for more than one sections.
3. Review and approve exams.
4. Ensure that CLOs are measure and delivered properly.
5. Evaluate the course file.
 | A course coordinator should have the experience on the courses that he is coordinating. All PhD holders (Male & Female) re assigned to coordinate courses. |
| Faculty Members | Each faculty member (Male and Female) is responsible to evaluate the attainment of CLOs in his/her courses. Also, he/she has to submit the course file that contains all activities in the course especially teaching strategies and assessment methods related to CLOs.  | Faculty members are involved in the assessment program through the preparation of course files and the assessment of CLOs. More specifically, they have to evaluate the attainment of each one of CLOs and prepare improvement plan. |
| SO Groups | There are four groups (Male and Female) , to evaluate SOs using PIs and Rubrics. Each group is responsible to prepare assessment plan of one or more SOs, to prepare rubrics, to review related assessment methods questions, collect data and evaluate SOs. SO Groups use a standard template to document the continuous improvement of SOs using rubrics  | Each SO group is head by one dedicated faculty member (SO Assessment Coordinator).Table 1.9 shows the SOs members and groups. |
| SO Assessment Coordinator | 1. Responsible to evaluate SO using PIs and rubrics
2. Documentation of necessary materials.
3. Make sure that the assessment of SOs is carried as planned.
 | The SO assessment coordinators are dedicated faculty members with experience in quality assurance system. |

Table 1.12: SO Assessment Groups and coordinators

|  |  |  |  |
| --- | --- | --- | --- |
| SO Group | SO Assessment Coordinator | Members | SOs |
| Group 1 | Dr. Mohammed Al Shargabi | Mrs.Nazeema | 2.1, 2.3 |
| Group 2 | Dr.Khairan Rajab | Mr.Kafil UddinMr. Mohamad Akram | 2.2, 3.1, 3.3 |
| Group 3 | Dr.Anwar Ali | Dr.Zakaria ToukalDr.Addin OsmanMr. Mohamed Basit | 4.1, 3.2, 2.5 |
| Group 4 | Dr.Asadullah Shaikh | Dr. Mohamed KhairiMr.ShahMasud | 2.43.42.6 |

 |
| ***Describe*** *the process and steps utilized for the complete assessment for all program learning outcomes (How does the system or process work?).*As mentioned in the previous sub-section that several assessment methods are used in the assessment and evaluation of program learning outcomes (SOs). We have also explained the major steps of our assessment system (planning, data collection, etc.). Figure 1.3 summarizes the process of our assessment system. According to our system, CLOs, SOs and PEOs are evaluated using several direct and indirect assessment methods to ensure the validity and unbiased of the evaluation results.Table 1.13 illustrates how our system is working with respect to each assessment method. More specifically, the table shows the frequency the assessment method is applied, involved people, how the results are evaluated and expected target. The end results of learning outcomes evaluation are **Minor changes or Major Changes. Minor changes** can be implemented every semester such as changes of teaching strategies, text books, number of exams, assignments and quizzes, etc. However, **major changes/improvements can be implemented after a complete assessment cycle** (3 years for our program). For example, major changes might be adding/removing courses, adding/ removing SOs or PEOs, update the curriculum, etc.Improvement plan based on the evaluation of program leaning outcome is another important aspect of our assessment system. We have two important improvement plans. First, the improvement plan which is based on the CLOs assessment are prepared each semester by the CC. This report is made of three sections 1) actions to be taken at a level other than the program 2) general actions to be implemented at the curriculum and program level and 3) actions to be implemented at a specific course levels. Second, the improvement plan which is based on the evaluation of SOs using PIs and rubrics. This improvement plan contains the following information for each SO [SO Improvement Plan]:1. Evaluation results of the previous assessment cycle.
2. Actions taken according the previous assessment cycle
3. Evaluation Results of each SO.
4. Actions to be taken according to the current assessment cycle. This includes the responsible people, expected time and type of actions (major or minor).

The documentation of the assessment of program learning outcomes is a crucial part of our system. For this reason, the DQU and SO Assessment Groups are responsible to document and maintain all evidences and related materials about the assessment of program learning outcomes.Table 1.13: Learning Outcomes Assessment System

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Frequency** | **Assessment Methods** | **People** | **Expected Target** | **Evaluation Results** |
| Each Semester | Course Learning Outcomes Assessment(Direct Method) | Faculty Members, CC, Coordinators of courses and Students | 65 %(SO is achieved if 65% of students achieve 65% of the SO) | By the end of each semester, The instructors submit course reports that contain the achievements of CLOs and SOs with suggested recommendations at the course level to the **DSC** and Curriculum Committee (**CC)**. The **DSC** collects the reports and prepares the achievements of all SOs by using the CLOs achievements. Further, the **CC** reviews the recommendations and meets with the academic staffs to discuss the recommendations and comments. Then, the **CC** and program council approve minor changes\* to be implemented. The **CC** will forward the major comments and improvements to the **DSC** to be discussed again each 3 years (Assessment Cycle). Figure 1.4 illustrates the process and steps of this method of assessment. |
| Each Semester | Exit Surveys(Indirect Method) | Students and DQU and DSC, CC | 65% of students answer agree or strongly agree | The **DQU and DSC** distribute and collect students’ answers in the exit survey (Male & Female). Minor improvements are reviewed and approved by the CC and program council and can be implemented every semester. Major changes according to the evaluation results of exit surveys will be implemented by the end of the assessment cycle (3 years). |
| Once a year | Current student Survey(Indirect Method) | Current Students and CC, DQU and DSC | 65% of students answer agree or strongly agree | By the end of each academic year, The opinions of students are taken through a survey called (Current Student Survey). The responses of students are analyzed and results are prepared. Minor improvements must be approved by the CC and program council prior implementation. However, the major changes are accumulated and a list of major improvements will then be presented to stakeholders for approval once in an assessment cycle (3 years). |
| Once a year | PAC meeting and Survey | PAC, Public Relation Committee (PRC), CC, DQU, Head of the Program | 75% of PAC answers Partially Important, Important, Very Important, Highly Important | By the end of each academic year, the PRC and DQU arrange a meeting with the PAC to discuss issues related to the program especially the program learning outcomes.PAC gives their opinions about the importance of the current SOs through a survey. Their recommendations need to be reviewed and approved by the CC and program council prior implementation. |
| Once a Year | Employer Survey | Employer of our graduates, DQU and DSC | 3.5/5 (70% answer agree or strongly agree) | DSC and DQU contact alumni and employer and ask them to fill out online Alumni and Employer Surveys. The collected data are evaluated. Minor changes need approval from the CC and program council before the implementation. By the end of the assessment cycle, overall evaluation of Program Educational Objectives and SOs using Alumni and Employer surveys. The results of the evaluation process will illustrate the extent to which each of the Program Educational objectives and SOs is being attained. The DSC will present and discuss the major changes with the CC and other stakeholders (faculty, PAC and students) for final approval. |
| Once a Year | Alumni Survey | Alumni, DQU and DSC and CC | 3.5/5 (70% answer agree or strongly agree) |
| Each two - three years (Assessment Cycle) | Assessment of Performance Indicators using Rubrics(Direct Method) | Students and Faculty, SO Assessment Group, Assessment Coordinators, DQU and DSC | 65% of students at the developing or above level.  | The SO Assessment Groups prepare the assessment plan for each SO. They contact faculty members to collect the appropriate data. They develop rubrics to evaluate SOs. The data are collected from thestudents' responses in the courses that are related to Performance Indicators (PIs). Then, the SO Assessment Group analyse the data and prepares results for each SOs using a very well set of defined rubrics. Recommendations and improvements are then discussed with department staffs. The department and college councils will then meet with other stakeholders to discuss the final improvements for approval.Figure 1.5 shows the major steps of these assessment methods. |

Figure 1.4: Assessment of CLOs and SOs using CLOs AssessmentFigure 1.5: Assessment of SOs using PIs and Rubrics |
| ***List*** *the strengths and recommendations for improvement of the learning outcome assessment (Based on the student performance results, how can the program improve?) (See Annual Program Reports for detailed data).*The performance of students in learning outcomes are measured directly in two assessment methods as mentioned above (CLOs assessment and PIs using Rubrics). Some actions were already taken to improve the learning outcomes of the program. Figure 1.6 illustrates the performance of student in learning outcomes by using the CLOs achievements in the last academic year (2015/2016). However, the evaluation results of SOs using PIs and rubrics are also available since the second semester 2013/20104. The list of strengths and recommendations for improvements are based on the performance of students in CLOs. As can be seen in Figure 4.6, most of SOs are not achieved due to the following main factors:* The level of English is very weak.
* Students are not willing to study at all.
* Their problem solving skills and intellectual thinking skills are not good.
* Learning outcomes are not well known by students.
* Attendance system: students can be absent 25% of the total lectures.
* Evaluation of teaching strategies is not effective

Figure 1.6: Student Performance Results Using CLOs Achievements (2015/2016)Based on the students' performance in learning outcomes, strengths and recommendations are defined below.**Strengths:*** The program adopted the world-wide outcomes for the computer science program (ABET a-k CS outcomes).
* There is a very efficient and systematic process to measure the performance of students. Using two direct assessment methods reduces the bias of one method.
* The learning outcomes of the program are taken from and meet the local needs. Also they fall into three domains of learning (Cognitive skills, Interpersonal Skills & Responsibility, Communication, Information Technology, and Numerical) in the National Qualification Framework (NQF).
* Learning outcomes at the program level are mapped to the learning outcomes at the course level. In addition, Learning outcomes at the program level are mapped to Program educational objectives.
* CLOs assessment each semester supports the program to have improved the program and courses by using evidence.
* Contradiction in the evaluation results between several assessment methods helps us in improvement (e.g. improvement in assessment methods, etc.).
* Internal benchmarking can be easily implemented to verify the improvement in CLOs and SOs.
* Individual course learning outcomes are put by dedicated faculty members.

**Recommendations for Improvement:*** Mapping courses to learning outcomes must be reviewed regularly.
* Motivate students toward learning and education.
* Student learning outcomes needs be benchmarked.
* Learning outcomes need to be well known by all teachers and students
* Relate course topics and chapters to learning outcomes.
* Teach and deliver the program according to learning outcomes.
* Design exams and assessment methods according to learning outcomes.
* Tutorial is highly recommended for all courses.
* Instructors should contact the lab instructors to make sure that the lab materials are consistent with the theory materials.
* Encourage students to come regularly to the instructors' office to complete understanding of the lectures especially when students miss lectures.
* Train students with the type of critical thinking questions rather than memorization.
* Motivate and encourage students to study outside class hours.
* Students must improve their levels in English
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*Evaluation of intended student learning outcomes. Refer to evidence about the appropriateness and adequacy of the intended learning outcomes for students in this program and* ***provide a report*** *including a list of strengths, recommendations for improvement, and priorities for action*.Several indirect assessment methods are used in our assessment system to evaluate the appropriateness and adequacy of intended learning outcomes. Figure 1.7 shows the evaluation results of SOs using opinions collected from current students, alumni and students about to graduates (Exit Survey). Based on the opinions of students (current, time of graduation and alumni), we can say that the intended learning outcomes are appropriate and adequate.Figure 1.7: Assessment of SOs using SurveysTable 1.5 shows that the current SOs are very important and are in-line with the dynamic needs of the industry based on the opinions of PAC.Based on the indirect assessment methods and opinions about the intended learning strengths and recommendations are defined below.**Strengths:*** Current SOs are appropriate and adequate for the Computer Science Graduates.
* All stakeholders give their opinions about the appropriateness and adequacy of the current learning outcomes.
* Learning outcomes are based on stakeholders needs and national and international standards.
* Valid indirect assessment methods such alumni and exit surveys, etc. are used to measure learning outcomes.

**Recommendations for Improvement and Priorities for action*** The program should develop an external benchmarking strategy to assess student learning outcomes.
* Develop a system to monitor the implementation of action or improvement plan.
* Enhance the alumni unit to collect data from alumni in a yearly basis.
* More and better participations from students in the surveys are required.
* Lab materials must be consistent with the theory materials.

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