Directorate of Higher Education Reviews

Programme Follow-Up Visit Report

Bachelor in Computer Science

College of Arts and Science

Applied Science University

Kingdom of Bahrain

First Follow-up Visit Date: 12-13 March 2018
Review Date: 9-11 May 2016

HC077-C2-F012

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The Programme Follow- up Visit Overview

The follow-up visit for academic programmes conducted by the Directorate of Higher Education Reviews (DHR) of the Education & Training Quality Authority (BQA) in the Kingdom of Bahrain is part of a cycle of continuing quality assurance reviews, reporting and improvement.

The follow-up visit applies to all programmes that have been reviewed using the Programmes-within-College Reviews Framework, and received a judgement of 'limited confidence' or 'no confidence'.

This follow-up visit Report is a key component of the programme review follow-up process, whereby the Bachelor in Computer Science (BCS), at Applied Science University (ASU) in the Kingdom of Bahrain was revisited on 12-13 March 2018 to assess its progress, in line with the published review Framework and the BQA regulations.

The subsequent sections of this Report have been compiled as part of Phase 2 of the DHR/BQA's programme follow-up cycle highlighted in the DHR Programme Review Handbook, and associated with the on-going process of institutional and academic quality and enhancement reviews of Higher Education Institutions located in the Kingdom of Bahrain.

A.   Aims of the Follow-up Visit

(i)   Assess the progress made against the recommendations highlighted in the review report (in accordance with the four BQA Indicators) of ASU's BCS since the programme was reviewed on 9-11 May 2016.

(ii)   Provide further information and support for the continuous improvement of academic standards and quality enhancement of higher education provision, specifically within the BCS programme at ASU, and for higher education provision within the Kingdom of Bahrain, as a whole.

B.   Background

The programmes-within-college review of the BCS programme, at ASU in the Kingdom of Bahrain was conducted by the DHR of the BQA on 9-11 May 2016.

The overall judgement of the review panel for the BCS programme of ASU was that of **'Limited confidence'**. Consequently, the follow-up process incorporated the review of the evidence presented by ASU to the DHR, the improvement plan, the progress report

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and its supporting materials, and the documents submitted during the follow-up site visit and those extracted from the interview sessions.

The external review panel's judgement on the ASU's BCS programme for each Indicator was as follows:

Indicator 1: The learning programme; '**satisfied**'
Indicator 2: Efficiency of the programme; **'satisfied'**
Indicator 3: Academic standards of the graduates; **'not satisfied'**
Indicator 4: Effectiveness of quality management and assurance **'satisfied'**

The follow-up visit was conducted by a Panel consisting of two members. This follow-up visit focused on assessing how the institution addressed the recommendations of the report of the review conducted on 9-11 May 2016. For each recommendation given under the four Indicators, the Panel judged whether the recommendation is 'fully addressed', 'partially addressed', or 'not addressed' using the rubric in Appendix 1. An overall judgement of 'good progress', 'adequate progress' or 'inadequate progress' is given based on the rubric provided in Appendix 2.

C.   Overview of the Bachelor in Computer Science

The BCS programme is offered by the Department of Computer Science of the College of Arts & Science in ASU. This programme is offered among two other programmes in the College, which are the Bachelor in Interior Design and the Bachelor in Graphic Design. Enrolment in the BCS programme commenced in 2006 when the programme was first offered and the total number of students who enrolled in the programme from inception to date is 82. According to the statistics provided by the institution, 40 students have graduated since the commencement of the programme; whereas, the number of students registered in the programme during the follow-up visit was 42. There are four administrative staff in the College and 25 faculty members, six of whom (1 Professor; 1 Associate Professor; 3 Assistant Professors; and 1 Lecturer) are appointed on a full-time basis in the Department of Computer Science and six, who are all lecturers, are part-timers.

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1.   Indicator 1: The Learning Programme

This section evaluates the extent to which the BCS programme of ASU, has addressed the recommendations outlined in the programme review report of May 2016, under Indicator 1: The learning programme; and as a consequence, provides a judgment regarding the level of implementation of each recommendation for this Indicator as outlined in Appendix 1 of this Report.

Recommendation 1.1: *Ensure in its next periodic review of the programme that the BCS course syllabi cover topics on human computer interaction, parallel and distributed computing, and systems fundamentals.*

Judgement: *Partially Addressed*

As mentioned in the progress report submitted by the Applied Science University (ASU) and as documented in minutes of meetings, the Computer Science (CS) department at ASU selected a programme team to conduct a thorough analysis of the Bachelor in Computer Science (BCS) programme in light of the recommendations of the BQA's 2016 review report. The team, as a result, informally benchmarked the BCS study plan against the 2013 curricula of the Institute of Electrical and Electronic Engineers-Association for Computing Machinery (IEEE-ACM) and, identified and carried out modifications of the topics included in various compulsory courses, so as to cover the IEEE-ACM-required knowledge areas for the courses 'Human Computer Interaction', 'Parallel and Distributed Computing', and 'Systems Fundamentals'. As a result, the BCS curriculum has been updated with the new topics, with the corresponding Programme and Course Intended Learning Outcomes (PILOs and CILOs), and the mappings between these two. It has also been formally approved by the proper channels at ASU, culminating in its endorsement by the University Council and in its introduction since September 2017. The courses 'Human Computer Interaction' and 'Parallel and Distributed Computing' have also been introduced as BCS major electives. The Panel looked at the revised programme and is satisfied that the knowledge areas of the courses are now covered. During interviews with faculty and senior management, the Panel was informed that the new BCS curriculum is being taken by the new cohort of students who enrolled in the academic year 2017-2018, whereas the cohorts of students who enrolled prior to that are continuing with the old curriculum in which the already existing course topics have been modified so as to cover the missing knowledge areas as explained above. However, based on a review of the evidence and site visit interviews with various stakeholders, the Panel was not provided with clear evidence on how students, who had completed courses before the required knowledge areas were added, had been accommodated. In addition, the Panel noticed discrepancies in relation to course titles, codes, descriptions, and content/topics in a few courses of the new curriculum, such as: the description of the

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course 'Mobile Computing' (CSC 436) is not properly covered in the course contents ('course structure'), which describe more of a course on *'Wireless and Mobile Networking'* than on *'Mobile Computing'*. Likewise, the code of the 'Probability and Statistics' course (CSC103) (latest revision 12/9/2017) is erroneously listed in the syllabus/course specification of 'Operations Research' (latest rev. 07/01/2018), whose code in the revised study plan is (CSC205). Consequently, in assessing the progress of the College against this recommendation, the Panel concludes that the College has put in place relevant procedures and mechanisms for the revision of the course syllabi; nevertheless, more focused work in this area is still recommended, in order to address discrepancies as the ones described above. In light of this, the Panel is of the view that the recommendation has been partially addressed.

Recommendation 1.2: *Review and revise the programme intended learning outcomes as necessary to ensure that the intended learning outcomes are more generic and well differentiated.*

Judgement: *Partially Addressed*

According to the progress report, the PILOs of the BCS programme have been analysed by the CS department's programme team and this analysis has led to a clear understanding of their areas of improvement. The team, as a result, conducted both a formal benchmarking process against the PILOs of the CS programmes of Philadelphia University and Al Ahliyya University (both in Jordan) through proper agreements with these institutions, and an informal benchmarking based on web-based information against the parallel programme of the University of Bahrain. The programme team also took into account the feedback of the external reviewer to the programme. As a result, a new set of nine PILOs has been produced, reducing the original PILOs number of 13. The Panel finds that the new PILOs are now more generic and well-differentiated. Nevertheless, the Panel is of the view that PILOs D1 ('*Communicate effectively as an individual, in teams and in multi-disciplinary settings together with the capacity to undertake lifelong learning*') and D2 ('*Demonstrate the ability to communicate findings to peers, senior colleagues and general audience through formal methods*') are still in need of revision and, thus, recommends that they should be rewritten so as to have one PILO about communication and the other about lifelong learning. Accordingly, the Panel finds this recommendation as partially addressed.

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Recommendation 1.3: *Review and revise the course intended learning outcomes ensuring that the learning outcomes within the same course are well differentiated, and are mapped to PILOs.*

Judgement: *Fully Addressed*

The progress report states that 'the programme team has carried out a comprehensive review of the CILOs and their links to the PILOs'. From review of the evidence and from interviews with faculty and senior management, the Panel notes that the BCS programme and its PILOs have undergone revisions and that the CILOs have also been revised to accordingly reflect these modifications, on the one hand, and to take into account the recommendation of BQA's 2016 review report on the other. In particular, a comprehensive matrix has been developed which maps the Intended Learning Outcomes (ILOs) of each course to the PILOs. The Panel is satisfied that CILOs have been revised and mapped to PILOs. Nevertheless, the Panel points out that, in a number of cases, newly designed/revised course specifications/syllabi do not explicitly contain a section in them which displays the mapping of the course ILOs to the relevant PILOs {e.g. 'Introduction to Computer Mathematics' (CSC001); 'Artificial Intelligence' (CS341); 'Data Communications & Computer Networks' (CS361); 'Operating Systems' (CS351) and 'Internship' (CS433)}. The Panel is of the view that CILOs, and their mappings to PILOs, should be included in each course syllabus and not just in the overall and extensively detailed CILO-to-PILO mapping matrix, so as to be clearer and more easily accessible/visible, in particular, for the students enrolled in these courses and for other relevant stakeholders. Nevertheless, the Panel finds that the recommendation has been fully addressed.

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2.   Indicator 2: Efficiency of the Programme

This section evaluates the extent to which the BCS programme of ASU, has addressed the recommendations outlined in the programme review report of May 2016, under Indicator 2: Efficiency of the programme; and as a consequence, provides a judgment regarding the level of implementation of each recommendation for this Indicator as outlined in Appendix 1 of this Report.

Recommendation 2.1: *Assess the workload of teaching staff and ensure they have adequate time for research and community engagement activities.*

Judgement: *Not Addressed*

As mentioned in the progress report, the faculty members' timetable for teaching has been reviewed by the programme team, with the aim of finding ways to distribute faculty's time more efficiently. In result of this review, two main measures have been taken by the programme team. The first is that of reducing academic staff members' planning/preparation time by giving each of them the same course sections or the same courses they had previously taught; while, the second is that of assigning those with particularly heavy non-teaching duties one or two basic courses to teach (e.g. 'Computer Skills' course). The Panel studied the faculty workload policy, the teaching schedule of the second semester of the academic year 2016-2017, as well as the workload assessment results presented by ASU as evidence, and noticed that although there has been a slight increase in faculty's research output and community engagement since the review of the programme, the College is still in need of allocating more time for faculty research, community service and engagement. This was further confirmed through interviews with the programme management and faculty members, who explained that their limited number of publications, due to lack of research time, hindered them from applying for academic promotion. This is in spite of the availability of a budget for research, with monetary incentives like stipends for publications and conference sponsorships. Consequently, the Panel is of the view that the measures taken thus far by the programme team are not effective to address the workload issues pointed out in the BQA's 2016 review report and, therefore, finds that this recommendation has not been addressed.

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Recommendation 2.2: *Ensure that there is an annual comprehensive evaluation of faculty performance that includes all promotion criteria.*

Judgement: *Fully Addressed*

The BQA's 2016 review report had pointed out that faculty appraisal was limited only to teaching, without covering aspects that are considered to be among the core functions of a Higher Education Institution (HEI), as well as faculty promotion components, such as: university, community, and professional service and engagement. As a result of this highlighted inadequacy, the College in coordination with the university's management redesigned the appraisal form used by the Heads of Departments (HoDs) for the evaluation of the faculty members. The newly designed form now includes a total of 28 evaluation items covering teaching, research, university and community engagement, professional service, in addition to personal/behavioural aspects, and has been implemented since the academic year 2016-2017. As confirmed through a review of a few samples of faculty evaluation forms, and as explained in interviews with academic and administrative staff, appraisals are conducted by the HoD online, and then forwarded to the Human Resources (HR) office, where they get converted into appraisal reports. These generated reports are then used for training needs' analysis, promotion, etc. The HR office also receives student evaluations of faculty and takes those into consideration with respect to the professional development targets and plans that the academic staff set for themselves. Interviews with faculty members revealed to the Panel that they are capable of viewing their appraisal results online and have the right to appeal the appraisal when not convinced with its results. The Panel is satisfied with the measures taken to address this recommendation and, thus, considers the recommendation as fully addressed.

Recommendation 2.3: *Expedite the process to build new premises so as to have one office per faculty member and provide appropriate informal study and recreational space/areas to meet the needs of the students.*

Judgement: *Fully Addressed*

During the follow-up site visit, the Panel toured the university campus while focusing, in particular, on the facilities and spaces referred to in the BQA's 2016 review report. Accordingly, the Panel visited faculty members' offices and noticed an office for each faculty member with office hours posted on the doors, including office spaces for part-time lecturers. This provided space for faculty offices has been made available as a result of the completion of a new building within the ASU campus, as well as the shifting of the faculty of law to another area. In addition, the Panel visited the cafeteria, which has been expanded in size to include indoor and outdoor seating areas that can

be used for both eating and studying, and the nearby student activities' hall, which is especially furnished and equipped for recreational purposes. Interviews with students, as well as a review of the student exit survey results and the analysis report of the 2016-2017 student satisfaction survey, confirmed to the Panel that there is an overall student satisfaction with the facilities and services provided by the University; although, they still wish for improved catering services. In light of the above, the Panel finds that the recommendation has been fully addressed.

Recommendation 2.4: *Assess the laboratory needs of BCS courses and provision laboratories to meet the identified needs.*

Judgement: *Partially Addressed*

The BQA's 2016 review report had pointed out that the CS department lacked specialized laboratories for courses such as: 'Data Communications and Computer Networks', 'Computer Graphics Algorithms', and 'Ciphering and Computer Security'. The Panel, therefore, checked the extent to which the laboratory needs of BCS courses have been assessed and, thereafter, addressed accordingly. From the tour of the campus facilities, the Panel established that there are five computer laboratories in total, four of which are dedicated for CS students while one is shared with students from other programmes. Interviews with IT support staff and with students as well confirmed that these laboratories are accessible at any time when not occupied, and IT support is continuously available to assist with troubleshooting problems. The Panel notes that the laboratories are of a good size and are reasonably well-equipped in terms of personal computers. As for the specialized software needed for the teaching of the CS courses, in particular, the Panel notes that upon scrutiny of what has been procured and made available in the laboratories, the software satisfactorily meets the needs of the BCS courses. The Panel also acknowledges the planning stages that were implemented after the BQA/DHR review of the programme, during which courses were mapped to required software and hardware to be procured for updating the laboratories. However, during interviews with faculty, the Panel confirmed that when a course is about to be taught, the faculty member responsible for teaching it identifies their hardware and software needs and submits them to the administration for procurement. The Panel finds this an indication of lack of long-term planning for resources and materials needed for the teaching and learning process. In addition, despite the availability in the laboratories of the needed CS specialized software, the Panel did not see evidence, during the tour, of any hardware related to fundamental BCS courses, like: networking, parallel computing, data mining, and micro computing. In result, the Panel recommends that the College should ensure the timely and adequate planning of all resources, whether software or hardware, and should follow this with their actual procurement. In light of this, the Panel is of the view that this recommendation has been partially addressed.

Recommendation 2.5: *Strengthen the links with professional scientific bodies such as IEEE and ACM through the creation of CS chapters at ASU, as well as local professional bodies.*

Judgement: *Fully Addressed*

To supplement formal learning beyond extra-curricular activities, seminars, and field trips, the CS Department managed to secure an organizational membership with the British Computer Society in the United Kingdom and an individual membership for all faculty members in the same society. This was confirmed by the Panel through an inspection of the membership subscription with this society and through interviews with the faculty members. In addition, two members of BCS faculty have got their membership in the IEEE and the Department has started at ASU the IEEE student chapter, which at the time of the follow-up visit consisted of 12 students. Furthermore, the Department has managed to have one of its faculty members selected as the representative for all Bahraini universities on the Colleges of Computing and Information Society (CCIS), which is a part of the Union of Arab Universities. All these memberships with the different professional scientific bodies help the Department stay updated with respect to the field of computer science, as was reported during the panel's interviews with senior management and faculty members. The Panel is satisfied with the steps taken to strengthen links with local and international professional bodies and advises the CS department to continue exerting more efforts for widening the scope of its memberships and partnerships. Accordingly, the Panel finds that this recommendation has been fully addressed.

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3. Indicator 3: Academic standards of the graduates

This section evaluates the extent to which the BCS programme of ASU, has addressed the recommendations outlined in the programme review report of May 2016, under Indicator 3: Academic standards of the graduates; and as a consequence provides a judgment regarding the level of implementation of each recommendation for this Indicator as outlined in Appendix 1 of this Report.

Recommendation 3.1: *Revise the methodology employed to determine the achievement of the programme intended learning outcomes.*

Judgement: *Fully Addressed*

The progress report states that the overall mapping matrix of PILOs and CILOs is a critical component in ensuring that the students achieve the PILOs, since an overall achievement of the CILOs automatically ensures the achievement of the PILOs to which they are mapped. From review of evidence and site visit interviews with faculty and senior management, the Panel was provided with a confirmation that a robust methodology is in place for directly assessing the achievement of the PILOs. Moreover, the Panel was informed that each course syllabus is (in principle) supposed to include the coverage of the CILOs and the instruments that are used in the course to assess them, and all this is internally and externally moderated, with all the revisions being validated by the proper channels at ASU. As explained in the progress report and as confirmed by site visit interviews and supporting evidence, the methodology implemented to ensure the achievement of the PILOs consists in creating two Excel sheets: (1) the Course Outcomes Assessment (COA) sheet, which shows the course marks with respect to each individual CILO (out of the total allocated to it) for each student, and (2) the Course Learning Outcomes Assessment (CLOA) sheet, which-based on the COA and the mapping of CILOs to PILOs- shows the achievement of the various PILOs for the various programme courses. Although it was reported in the progress report that this new methodology was approved by 'an external quality assurance expert', the Panel could not find evidence of this expert nor his/her report. In addition to this methodology, the Department has also provided evidence of indirect methods of assessing the achievement of the PILOs such as: survey questionnaires that have been designed and used to collect feedback about the achievement of PILOs by the CS graduates (e.g. surveys of employers of BCS graduates and internship reports filled in by employers as evaluations of BCS interns). The Panel further scrutinized the course files provided during the site visit and is satisfied that the methodology is put in place and is suitable to determine the achievement of the PILOs and, thus, finds this recommendation to be fully addressed.

Recommendation 3.2: *Fully implement ASU benchmarking policy and expand the benchmarking activities to include admission criteria, learning resources, the achievement of students and the standards of assessment.*

Judgement: *Partially Addressed*

In addition to the BCS programme benchmarking against the IEEE-ACM CS Curricula 2013 (See Recommendation 1.1) in terms of coverage of all the required knowledge areas, there is evidence that proper agreements were signed with Philadelphia University and Al Ahliyya University, both in Jordan, for the formal benchmarking of the BCS programme at ASU with programmes offered by the two universities. A similar benchmarking was conducted with the CS programme of the University of Bahrain, but only informally since it was based on information available on the web. These benchmarking activities included the categories of the PILOs, the admission criteria, the assessment methods, and the learning resources. In terms of the BCS programme ILOs, these have been revised to reflect the benchmarking, and so have the admission criteria which have been revised to be more in line with those of the two Jordanian universities. This is evident through the fact that the previous admission criteria required all students with non-scientific secondary school background to take four compulsory 0-credit remedial courses ('Introduction to Computer Science', 'Introduction to Computers Mathematics', 'Introduction to Mathematics and Statistics', and 'Introduction to Programming'); while, the new admission criteria state- in line with those of the two universities- that 'All students from non-scientific secondary school discipline have to enrol and pass one remedial course with 0 credit hours which is 'Introduction to Computer Mathematics' (CSC001) prior to their registration in the major courses, except students who have graduated from scientific secondary school discipline or equivalent'. Similarly, the assessment methods in the BCS programme are comparable to those of the two universities in Jordan, as they include formative and non-formative techniques, such as reports, essays, projects, e-learning assignments, and presentations. With respect to the learning resources, a mention of the use of an online system for communication with students and exchange of learning materials in the two Jordanian universities was the conclusion of the benchmarking. In retrospect, though the benchmarking with respect to PILOs was done in a satisfactory way, the Panel is nevertheless concerned about the benchmarking result of the admission criteria in particular, given that the report could extend in depth through a more thorough benchmarking with possibly more measurable criteria. Therefore, the Panel recommends the evaluation of the effectiveness of the new revisions based on the benchmarking exercise, especially those related to the admission criteria, as well as the implementation of further benchmarking processes that rely on more specific and assessable criteria. Consequently, in assessing the progress of the College against this recommendation,

the Panel concludes that the College has addressed this recommendation but only partially.

Recommendation 3.3: *Develop a strict policy with respect to plagiarism and apply it to all student work, not just final year graduation projects.*

Judgement: *Partially Addressed*

From the review of the supporting materials provided and from site visit interviews with faculty and students, there is evidence of a clear policy on plagiarism, which has been in place since November 2016, and it stipulates 'zero-tolerance' toward any such acts. Students are made aware of plagiarism and its risks through the university website; induction day; academic advising; course syllabi which are distributed to them in the beginning of each semester; and through the 'Computer Skills' (CS104) course in which plagiarism is introduced as a topic. Moreover, the 'Turnitin' plagiarism detection software has been embedded in the e-learning system (MOODLE) and students use it to conduct similarity checks of their works. Disciplinary rules are also in place, that set down the actions to be taken in cases of plagiarism, namely: the issuance of a first warning, in case a student's work fails the 'Turnitin' filter the first time it is submitted, to the reporting of the case to the HoD, Dean, and then the Misconducts Committee for investigation in cases of major and/or repeated offenses. During the follow-up visit, the Panel noticed a convergence between the interviewed faculty members and students on the implementation of the plagiarism policy and the use of 'Turnitin' 'with any report'. Nevertheless, there was no clear evidence that this was indeed the case in all courses. As a matter of fact, it is stated in the University Plagiarism Policy that '*Colleges must identify any specific courses where the use of e-detection software should become routine. Colleges may also decide, from time-to-time, to target specific courses, either as regards all assessed work or via a sampling process…*' but the Panel found no formal evidence of which courses have been selected by the Computer Science Department for the routine use of the plagiarism-detection software. Accordingly, the Panel recommends that the College clarify exactly what types of BCS student works should undergo similarity checks through the plagiarism e-detection software. As a result, in assessing the progress of the College against this recommendation, the Panel concludes that the College has only partially addressed this recommendation.

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Recommendation 3.4: *Reconsider the methodology employed to determine the achievement of the course intended learning outcomes and ensure that programme and course intended learning outcomes are systematically and exhaustively assessed.*

 Judgement: *Partially Addressed*

As mentioned for Recommendation 3.1, the CILOs have systematically been defined for all the courses of the CS programme and an overall detailed matrix has been designed which maps the CILOs to the PILOs. Moreover, as arrived at from an inspection of a considerable sample of course syllabi, each course syllabus includes the coverage of the CILOs and the instruments that are used in the course to assess them. As such, through an examination of a sample of course files, the Panel has checked that each assessment instrument clearly states which CILOs are assessed in the various questions and the marks assigned to each. The Panel finds the new methodology that has been introduced to check the students' achievement of the PILOs satisfactory. As explained for Recommendation 3.1, it consists in creating two Excel sheets: (1) the Course Outcomes Assessment (COA) which shows the course marks with respect to each individual CILO (out of the total allocated to it) for each student, and (2) the Course Learning Outcomes Assessment(CLOA) which, based on the COA and the mapping of CILOs to PILOs, shows the achievement of the various PILOs for the various programme courses. The methodology thus allows the instructors, the programme coordinator, and the whole Department to check the achievement of each student on each CILO, hence on each PILO, through the COA and CLOA. The Panel is satisfied that this methodology allows the determination of the detailed achievement of each student. In addition, the Quality Assurance (QA) Unit of the College revised and updated the internal and external moderation forms to include among their criteria two that are directly related to the validity of assessment questions in assessing CILOs, on the one hand, and the distribution of marks according to CILOs on the other. Nevertheless, the Panel found no evidence of anything being done to remedy situations such as a student passing a course although he/she fails to achieve (say 50% or whatever required threshold on) one of its CILOs, and some such cases were found among the provided evidence {e.g. 5/15 for a student on CILO a1 in 'Mathematics II' (MAT201)}. The Panel therefore advises the College to address this issue in order to ensure better achievement of CILOs and related PILOs and to assess the effectiveness of its process in assuring the achievement of learning outcomes. In light of this, the Panel finds that this recommendation has been partially addressed.

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Recommendation 3.5: *Develop a mechanism to monitor the implementation of the internal moderation system and evaluate its effectiveness.*

Judgement: *Not Addressed*

There is evidence of the existence of a mechanism that is set to monitor the implementation of the internal moderation and to evaluate its effectiveness. As described in the progress report, this mechanism involves the instructor, the internal moderators, the HoD and programme coordinator, the Dean, and the QA Unit. As confirmed during site visit interviews with faculty and senior management, first, the course specifications are checked and validated with respect to all their details (contents, CILOs, mappings to topics, assessment instruments, etc.). Then, by closely adhering to their course specification, each instructor will prepare the mid-term examination and, in due time, the final examination. The Panel is satisfied that the mid-term and final examinations are systematically internally pre-moderated by faculty members who are selected according to their profile and teaching experience; and that evidence was systematically found of suggestions for modifications to examination questions that were made by internal moderators, and the suggestions had been taken into account by the course instructors. As was mentioned in Recommendation 3.4 above, a new internal moderation form has been designed to make the procedure easier and more effective. In addition to the internal pre-moderation, the Panel found evidence of post-moderation whereby the moderator checks the course assessments of students' works (final examinations, quizzes, reports, etc.) and returns their report to the HoD, who discusses them with the Department Council, before any final validation of the course marks by the course instructor. The programme coordinator and the HoD closely follow the internal moderation processes and the results of both are forwarded to the College QA Unit to check the effectiveness of the internal moderation and then to the University QA Centre for verification. The Panel is satisfied that a mechanism is in place to monitor and evaluate the implementation and effectiveness of the internal moderation. Nevertheless, the Panel notes that, in a number of courses, the CILOs were not properly mapped with the topics or assessments. For instance, for the course 'Introduction to Computer Mathematics' (CSC 001), some CILOs were improperly placed in the weekly coverage of the syllabus (e.g. c_1 is incorrectly selected for the type of content of weeks 1 to 3); and then, some questions on assessments were misclassified. For example, Question 2 of the final examination of this course is not a critical thinking question although it was mapped as such. Additionally, in Assignment 1, which was mapped to a critical thinking CILO, there were no critical thinking questions and similarly, Q3 (applying de Morgan's law given some sets) and Q4 (converting from one number system to another) were incorrectly categorised as critical thinking questions. Similar misclassifications of CILOs were found in other courses such as 'Artificial Intelligence' (CSC341) and 'Data Communications and Computer Networks' (CSC 361). Moreover,

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it is hardly conceivable that in Week 0 of the 'Internship' (CS433) course, which is supposed to be an introductory week to the internship, the students would get into Critical Thinking c1 ('Examine work practices and identify areas where application of theory will enhance work-based practices'), as is included in the specification of this course. Since such errors were repeated here and there in various assessments and were not caught by the internal (nor external) moderator, this raises a serious question about the effectiveness of the moderation process. Accordingly, although the Panel acknowledges the efforts exerted by the College in addressing this recommendation, the Panel is of the view that this recommendation has not been addressed.

Recommendation 3.6: *Implement all ASU's external moderation policies and procedures, especially those related to the selection of external examiners, and ensure effective external moderation of all graded work.*

Judgement: *Not Addressed*

From what is stated in the progress report and in the supporting materials, a policy and procedure is in place to select external moderators based on their qualifications and experience. In accordance with the university policies, the CS department starts by selecting appropriate CVs for external moderators. The college's Academic Standards and Examinations Committee studies the department's selection and then makes a recommendation to the Dean and from him to the university management. Despite this procedure, however, the Panel noticed as a result of studying the CVs of the three external moderators which ASU has contracted, that all of them are from Al-Yarmouk University in Jordan, with the exception of one external examiner, who is from Malaysia. As a result, the Panel is of the view that the College needs to ensure greater variety within its group of external moderators, especially after the fact that all moderators are from the same institution was raised as a red flag in the BQA's 2016 review report, and the improvement plan submitted by ASU indicated that efforts will be made to recruit external moderators from a number of institutions. With respect to the external moderation process, all final examination papers and solutions, along with course descriptions and empty moderation forms, are sent to the external moderator who goes over all the details related to the assessment and the grading, and reports back to the college Academic Standards and Examinations Committee by filling the specific moderation form (which as was mentioned in Recommendation 3.3 was newly revised) and sending it back along with the moderated examination papers. The package then passes by the HoD and on to the course coordinator who takes action with respect to any points that are raised by the external moderator. This entire procedure is closely followed by the programme coordinator, the HoD, the College QA Unit, and the University QA and Accreditation Centre. The latter two particularly focus on the evaluation of the external moderation and its effectiveness. The progress report also mentioned that the graduation project is 'assessed by an

external specialist simultaneously with the internal panel (jury)' and that, for the internship report, 'the field supervisor is participating in the student work assessment… in parallel with the internal panel (jury)'. Although the Panel recognizes the efforts of the College to ensure effective external moderation of all graded work, the Panel finds that what is described in the progress report as an external moderation of the graduation projects and the internship, amounts to the participation of an 'external expert' as a member of an assessment jury in each case rather than an actual external moderation (of the two courses). Also, as mentioned for the case of Recommendation 3.5, the incorrect classifications of CILOs managed to pass through the filter of external moderation as well, which here also raises questions about its effectiveness. Accordingly, the Panel concludes that the College has not addressed this recommendation.

Recommendation 3.7: *Develop and implement mechanisms to ensure the level of student's achievement is appropriate for the programme type and level.*

Judgement: *Partially Addressed*

The progress report states that a number of mechanisms have been developed and implemented at ASU from the second semester of the academic year 2016-2017 to ensure that the BCS students' achievement is appropriate. They include revising and clearly defining CILOs and their mapping to PILOs; internal pre- and post-assessment moderation; external moderation; annual external review of courses including the suitability of the level of graduation projects and internship reports; and, last but not least, the surveying of graduates' employers and alumni. The Panel has reviewed the assessments of various courses and is satisfied that there is an overall improvement in the level of these assessments compared to what had been noted during the previous programme review. However, the homework and examinations of a number of courses still tend to avoid challenging problems that go beyond the straightforward application of procedures/algorithms (See, for instance, courses like 'Introduction to Computer Mathematics' (CSC 001), 'Database Systems' (CSC 336), 'Data Communications and Computer Networks' (CSC 361), and 'Artificial Intelligence' (CSC 341). The Panel therefore recommends that the College should pay more attention to this aspect of the students' achievements. As for the graduation project, as mentioned for Recommendation 3.8 below, the Panel has found the quality of the work produced by the graduating students of a suitable level. Based on the above, the Panel finds that this recommendation has been partially addressed.

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Recommendation 3.8: *Ensure the academic standards of graduates and that student work including graduation projects is free of plagiarized content.*

Judgement: *Partially Addressed*

As was mentioned for Recommendation 3.3, ASU has adopted a zero-tolerance policy with respect to plagiarism and the Panel notes that efforts are being put to ensure this goal is reached as quickly as possible. In particular, with respect to the graduation project, the policy is clear, and evidence supports that all graduation project reports have to go through the 'Turnitin' plagiarism detection software, with its similarity reports being directly sent to the students' supervisors who eventually check the reports and comment on them in a specific form designed to this effect. There is also evidence of a case of a student who failed the graduation project course because of proven plagiarism. In addition, the Panel conducted online checking for plagiarism for random passages of a sample of graduation project reports during the follow-up visit and the results showed no plagiarism. As for assessment of the graduation project, it is evaluated at midterm and at the end of the project by a panel consisting of an external assessor and three internal assessors (the supervisor, and two faculty members). The Panel reviewed all the graduation projects defended in December 2017 and noted a quality work of suitable level, good development methodology, implementation, and dissertation. However, despite the fact that the BQA's 2016 review report highlighted that in terms of academic standards of graduates, the alumni were found to be lacking in problem-solving competencies and practical skills, and despite ASU noting in its improvement plan the step of evaluating students' achievements against graduate attributes, no mention of these skills or of such evaluation was found in the submitted progress report. Nevertheless, interviewed alumni reported a general satisfaction with their preparation for the job market; although, they mentioned finding difficulty with programming and with working with servers and felt that their BCS programme's content needed more depth. Similarly, interviewed employers expressed general satisfaction with BCS graduates' skills, especially with their presentation and communication skills; however, they did report that the graduates are in need of stronger project management competencies. In light of all the above, the Panel notes the progress achieved by the University to ensure the academic standards of the BCS graduates; however, the Panel recommends that ASU adhere to its original improvement plan with respect to evaluating students' achievements against graduate attributes. Accordingly, the Panel concludes that the College has only partially addressed this recommendation.

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Recommendation 3.9: *Implement ASU policy and procedures related to the assessment of internships and ensure that the student work meet the course level and stated ILOs.*

Judgement: *Not Addressed*

According to the progress report, the programme team has revised the course description for 'Internship' (CSC441). Upon scrutiny of the revised description, the Panel noticed that it includes an emphasis on a proper redefinition of the CILOs and the appropriate assessment of each of them, with each CILO being assigned a specified allocation of marks. Like in every course, these CILOs are mapped to the PILOs through a mapping matrix, so that the collective achievement of the CILOs ensures the achievement of the PILOs to which they are mapped. Achievement of the internship CILOs is evaluated through assessments divided between the field supervisor, on the one hand, and a panel of three members among them the academic supervisor, on the other hand. The field supervisor assesses interns on criteria such as: attendance, punctuality, cooperation, efficiency and accuracy in accomplishing tasks, decision-making, creativity, computer skills, and response to extra work. Whereas, the academic panel focuses on evaluating a technical report submitted by each intern documenting the issues and topics of their internship. The Panel notes that though this is theoretically sound, the sample of internship reports studied during the follow-up site visit did not portray work that meets the course-level stated ILOs. This is because the reports examined by the Panel were quite light, including a too brief explanation of the 'modus operandi of the company' in which the students were doing their internship, and some forms in Microsoft Access which reflected what their work was about. The Panel thus finds the work performed by the interns too basic and far from being suitable for a BCS student at a higher education level. Accordingly, although the Panel recognizes the programme team's efforts in revising the internship course description, the Panel concludes that the College has not addressed this recommendation.

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4. Indicator 4: Effectiveness of quality management and assurance

This section evaluates the extent to which the BCS programme of ASU, has addressed the recommendations outlined in the programme review report of May 2016, under Indicator 4: Effectiveness of quality management and assurance; and as a consequence provides a judgment regarding the level of implementation of each recommendation for this Indicator as outlined in Appendix 1 of this Report.

Recommendation 4.1: *Ensure that the QAU better monitors and evaluates the effectiveness of the implementation of the policies and procedures relevant to assessments of students' work.*

Judgement: *Partially Addressed*

The Quality Assurance and Accreditation Centre (QAAC) at ASU is responsible for managing and monitoring the implementation of all policies and procedures in the University, among them those related to assessments of students' work. The QAAC fulfils this responsibility through a number of mechanisms and actions, such as: holding periodic meetings to discuss implementation of policies and procedures; following up on and evaluating internal audits on course specifications at the beginning of each semester; following up on and evaluating the performance of both internal and external moderators; reviewing and assessing the effectiveness of post-moderation audits; supporting, coordinating and following up on the external review of the programme; and regularly reviewing the performance of the QA Unit in the College to ensure its compliance with its responsibilities, which include supervising the implementation of policies and procedures relevant to assessment of students' works. The College QA Unit is made up of the programme leaders in the College plus the QA College Director. As explained by senior management during interviews, this QA Unit is audited by the QAAC on a yearly basis, with the aim of evaluating its effectiveness; it is also subjected to regular monitoring checks by the QAAC throughout the academic year. The University QAAC acts therefore as a second layer of ensuring quality of policy and procedures' implementation, with the College QA Unit acting as the first; since, the latter is the party directly responsible for closely monitoring such quality implementation at the college level, through a number of its own systems and mechanisms. With respect to assessment policy and procedures, the College QA Unit Director reported in interviews with the Panel that the Unit developed a system of monitoring the academic integrity of students' work, through accessing the MOODLE's system's usage by all faculty members twice a semester, to make sure that all academic staff members are using this e-learning platform with the plagiarism detection software (TurnitIn) that is integrated with it. This type of

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monitoring is carried out mid-semester and in the end of each semester. In addition, with the Academic Standards & Examinations Committee, the QA College Unit monitors internal moderation as well as the work of the external examiners in terms of their seriousness, commitment, and quality of comments. From studying a sample of QA audit reports, the Panel noticed that course files with assessment tools and assessed and moderated students' works are audited every semester by the College QA Unit. When issues are spotted or missing in a certain course file, the file is sent back to the course coordinator to address its issues and then a second audit of the file is conducted once again by the College QA Unit. Additionally, in the end of the year, the Head of the College QA Unit makes a final audit of eight course files that are randomly selected and submits a summary report to the University QAAC for all programmes, after giving feedback to the programme leaders and HoDs. Although the Panel acknowledges all these efforts exerted by the College and the Department in monitoring and evaluating the effectiveness of the implementation of policies and procedures related to assessment of students' works, the Panel is still concerned with the inadequacies pointed out in Indicator 3 recommendations, such as: lack of agreement with respect to implementation of the plagiarism policy; mapping of assessments with CILOs; effectiveness of the internal and external moderation systems; level of students' achievement; evaluating students' achievements; and assessed internship works. The Panel, therefore, recommends that the College should apply more rigor in its QA monitoring and evaluation processes, and provide professional development opportunities targeted at enhancing faculty members' knowledge and skills in relation to proper assessment development and design. Accordingly, the Panel is of the view that this recommendation is partially addressed.

Recommendation 4.2: *Ensure that the structured comments of all relevant stakeholders are gathered, analysed and used to improve the BCS programme and that the outcomes are communicated to the stakeholders on a regular basis.*

Judgement: *Partially Addressed*

The progress report states that beginning the academic year 2016-2017, the College QA Unit started periodically collecting internal and external stakeholders' feedback (e.g. students' course evaluations; students' satisfaction surveys; employer survey; and alumni survey) at the end of each academic year. The collected data is then sent to the Unit of Measurement and Evaluation of the QAAC for analysis and for utilization in the preparation of the annual review report. The progress report also states that recommendations are made in the Department Council based on the analysed data and then these recommendations are used in the development of plans of actions for the following year. Both the recommendations and the action plans are presented to the Advisory Board for discussion and for possible amendments in the programme based on the output of those discussions. The Panel studied the minutes of meetings

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of the Board and confirmed that recommendations and action plans prepared on the basis of feedback analysis are discussed regularly in the Board's meetings. The Panel was also presented with samples of filled student satisfaction surveys and employer surveys; however, no filled alumni surveys or graduating students' exit surveys were provided, although the Panel had requested them. Nonetheless, the Panel was provided with analysis reports of the results of these surveys. Similarly, no filled forms of student evaluations of courses/faculty were provided; since, as was reported during interviews with faculty and students, these evaluations are done online and the system does not allow printing these evaluation forms once submitted by the students. Despite this, the Panel was provided with a summary sheet of evaluation results for a number of courses. The Panel acknowledges the keenness of the College and the Department in gathering and analysing stakeholders' feedback and informing the Advisory Board and student representatives of the analysis results and changes made upon them. Nonetheless, employers and internship supervisors interviewed during the follow-up visit reported that although they had been involved in filling a satisfaction survey, they were not informed of actions done on the basis of their feedback. This was further confirmed to the Panel through interviews with senior management who reported that there is supposed to be a yearly meeting with employers to inform them of changes made as a result of their survey participation but, unfortunately, this meeting has not been regularly conducted. Equally, alumni reported that, so far, they have participated in one online satisfaction survey and this was only two months before the scheduled follow-up visit and, therefore, had not yet been informed of the results of their feedback. The Panel, thus, recommends that the College continues with its process of collecting and analysing feedback, while ensuring that all stakeholders are both regularly involved in, and informed about, the feedback process and its outcomes on improving the BCS programme, and assesses the effectiveness of this process on a regular basis. Accordingly, the Panel is of the view that this recommendation is partially addressed.

Recommendation 4.3: *Further investigate the market needs in relation to the current high number of unemployed graduates and low cohort numbers.*

Judgement: *Not Addressed*

The BQA's 2016 review report had indicated a high unemployment rate of the BCS graduates, with no evidence of relevant and reliable labour market studies conducted to evaluate if the BCS programme is up-to-date and needed by the market. As a result, ASU had included in its improvement plan actions such as assessing the labour market needs and exploring the reasons behind the low number of graduates' recruitment. Despite this, the Panel found through interviews and the scrutiny of provided evidence that no formal labour market study was done. During interview sessions, the Panel was informed that ASU is in the process of establishing a unit for conducting

formal labour market studies and, thus, relies in the meantime on stakeholders' feedback, primarily inputs from the Programme Advisory Board and the employers and internship field supervisors' surveys. This is in addition to relying on a number of websites that report data related to employment trends and labour market requirements, extracted from various entities in Bahrain, such as TAMKEEN, the Ministry of Labour, Gulf Talent, and the Higher Education Council. Accordingly, since the College has not done anything much different from the last programme review, with respect to scoping the needs of the local labour market, the Panel considers the recommendation as not addressed.

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5. Conclusion

Taking into account the institution's own progress report, the evidence gathered from the interviews and documentation made available during the follow-up visit, the Panel draws the following conclusion in accordance with the DHR/BQA Follow-up Visits of Academic Programme Reviews Procedure:

The Bachelor in Computer Science programme offered by Applied Science University has made Adequate Progress and as a result, the programme will not be subjected to another follow-up visit.

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Appendix 1: Judgement per recommendation.

Judgement	Standard
Fully Addressed	The institution has demonstrated marked progress in addressing the recommendation. The actions taken by the programme team have led to significant improvements in the identified aspect and, as a consequence, in meeting the Indicator's requirements.
Partially Addressed	The institution has taken positive actions to address the recommendation. There is evidence that these actions have produced improvements and that these improvements are sustainable. The actions taken are having a positive, yet limited impact on the ability of the programme to meet the Indicator's requirements.
Not Addressed	The institution has not taken appropriate actions to address the recommendation and/or actions taken have little or no impact on the quality of the programme delivery and the academic standards. Weaknesses persist in relation to this recommendation.

Appendix 2:   Overall Judgement.

Overall Judgement	Standard
Good progress	The institution has fully addressed the majority of the recommendations contained in the review report, and/or previous follow-up report, these include recommendations that have most impact on the quality of the programme, its delivery and academic standards. The remaining recommendations are partially addressed. **No further follow-up visit is required.**
Adequate progress	The institution has at least partially addressed most of the recommendations contained in the review report and/or previous follow-up report, including those that have major impact on the quality of the programme, its delivery and academic standards. There is a number of recommendations that have been fully addressed and there is evidence that the institution can maintain the progress achieved. **No further follow-up visit is required.**
Inadequate progress	The institution has made little or no progress in addressing a significant number of the recommendations contained in the review report and/or previous follow-up report, especially those that have main impact on the quality of the programme, its delivery and academic standards. For first follow-up visits, a second follow-up visit is required,

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