

الهيئة الوطنية
للمؤهلات وصنمان جودة التعليم والتدريب
National Authority for Qualifications &
Quality Assurance of Education & Training



Directorate of Higher Education Reviews

Programmes-within-College Reviews Report

**B.Sc. in Computer Science
College of Information Technology
University of Bahrain**

Kingdom of Bahrain

Date Reviewed: 9 - 11 December 2013

HC022-C1-R022

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Acronyms

ABET	American Board for Engineering and Technology
ABET CAC	ABET Computing Accreditation Commission
CAC	College Accreditation Committee
CILOs	Course Intended Learning Outcomes
CIT	College of Information Technology
CS	Computer Science
DAC	Department Accreditation Committee
DCS	Department of Computer Science
DHR	Directorate of Higher Education Reviews
HEC	Higher Education Council, Kingdom of Bahrain
ILO	Intended Learning Outcome
IT	Information Technology
MIS	Management Information Systems
NQF	National Qualification Framework
PEOs	Programme Education Objectives
PIAC	Programme Industrial Advisory Committee
PILOs	Programme Intended Learning Outcomes
PIs	Performance Indicators
PSAC	Programme Student Advisory Committee
QAA	Quality Assurance Agency, U.K.

QAAC	Quality Assurance and Accreditation Centre (of UOB)
QQA	National Authority for Qualifications & Quality Assurance of Education & Training, Bahrain
SER	Self-Evaluation Report
UOB	University of Bahrain

1. The Programmes-within-College Reviews Process

1.1 The Programmes-within-College Reviews Framework

To meet the need to have a robust external quality assurance system in the Kingdom of Bahrain, the Directorate of Higher Education Reviews (DHR) of the National Authority for Qualifications & Quality Assurance of Education & Training (QQA) has developed and is implementing two external quality review processes, namely: Institutional Reviews and Programmes-within-College Reviews which together will give confidence in Bahrain's higher education system nationally, regionally and internationally.

Programmes-within-College Reviews have three main objectives:

- to provide decision-makers (in the higher education institutions, the QQA, the Higher Education Council (HEC), students and their families, prospective employers of graduates and other stakeholders) with evidence-based judgements on the quality of learning programmes
- to support the development of internal quality assurance processes with information on emerging good practices and challenges, evaluative comments and continuing improvement
- to enhance the reputation of Bahrain's higher education regionally and internationally.

The *four* indicators that are used to measure whether or not a programme meets international standards are as follows:

Indicator 1: The Learning Programme

The programme demonstrates fitness for purpose in terms of mission, relevance, curriculum, pedagogy, intended learning outcomes and assessment.

Indicator 2: Efficiency of the Programme

The programme is efficient in terms of the admitted students, the use of available resources - staffing, infrastructure and student support.

Indicator 3: Academic Standards of the Graduates

The graduates of the programme meet academic standards compatible with equivalent programmes in Bahrain, regionally and internationally.

Indicator 4: Effectiveness of Quality Management and Assurance

The arrangements in place for managing the programme, including quality assurance, give confidence in the programme.

The Review Panel (hereinafter referred to as ‘the Panel’) states in the Review Report whether the programme satisfies each Indicator. If the programme satisfies all four Indicators, the concluding statement will say that there is ‘confidence’ in the programme.

If two or three Indicators are satisfied, including Indicator 1, the programme will receive a ‘limited confidence’ judgement. If one or no Indicator is satisfied, or Indicator 1 is not satisfied, the judgement will be ‘no confidence’, as shown in Table 1 below.

Table 1: Criteria for Judgements

Criteria	Judgement
All four Indicators satisfied	Confidence
Two or three Indicators satisfied, including Indicator 1	Limited Confidence
One or no Indicator satisfied	No Confidence
All cases where Indicator 1 is not satisfied	

1.2 The Programmes-within-College Reviews Process at the University of Bahrain

A Programmes-within-College review of the College of Information Technology was conducted by the DHR of the QQA in terms of its mandate to review the quality of higher education in Bahrain. The site visit took place on 9-11 December 2013 for the academic programmes offered by the college, these are: B.Sc. in Information System (BSIS); B.Sc. in Computer Science (BSCS); and B.Sc. in Computer Engineering (BSCE).

This report provides an account of the review process and the findings of the Panel for the B.Sc. Computer Science (BSCS) based on the Self-Evaluation Report (SER) and appendices submitted by the University of Bahrain (UOB), the supplementary documentation made available during the site visit, as well as interviews and observations made during the review site visit.

UOB was notified by the DHR/QQA in May 2013 that it would be subject to a Programmes-within-College reviews of its College of Information Technology with the site visit taking place on 9-11 December 2013. In preparation for the review, UOB conducted its college self-evaluation of all its programmes and submitted the SER with appendices on the agreed date in September 2013.

The DHR constituted a panel consisting of experts in the academic field of Information Technology and Computing and in higher education who have

experience of external programme quality reviews. The Panel comprised five external reviewers.

This Report records the evidence-based conclusions reached by the Panel based on:

- (i) analysis of the Self-Evaluation Report and supporting materials submitted by the institution prior to the external peer-review visit
- (ii) analysis derived from discussions with various stakeholders (faculty members, students, graduates and employers)
- (iii) analysis based on additional documentation requested and presented to the Panel during the site visit.

It is expected that the UOB will use the findings presented in this report to strengthen its BSCS. The DHR recognizes that quality assurance is the responsibility of the higher education institution itself. Hence it is the right of UOB to decide how it will address the recommendations contained in the Review Report. Nevertheless, three months after the publication of this Report, UOB is required to submit to the DHR an improvement plan in response to the recommendations.

The DHR would like to extend its thanks to UOB for the co-operative manner in which it has participated in the Programmes-within-College review process. It also wishes to express its appreciation for the open discussions held in the course of the review and the professional conduct of the faculty in the BSCS.

1.3 Overview of the College of Information Technology

The College of Information Technology was established in 2003. The mission of the College revolves around excellence in student learning, generation and dissemination of knowledge, and community engagement. The College offers three undergraduate programmes which are B.Sc. in Computer Science, B.Sc. in Computer Engineering, and B.Sc. Information Systems. The three programmes were accredited by ABET in 2010. Moreover, the College offers the M.Sc. programme in Information Technology for which there are still no graduates.

At the commencement of the 2013-2014 academic year the number of students enrolled in the College was 1540, supported by 85 faculty members, 46 administrative staff, and an excellent infrastructure including computing facilities, classes, halls and offices available to students and faculty. The College assures the quality of its programmes through a continuous process of self-assessment that involves all its stakeholders. Furthermore, the College aspires to be a regional leader in the ICT education field, promoting innovation and excellence through its programmes, research, and activities.

1.4 Overview of the B.Sc. in Computer Science

The B.Sc. in Computer Science was initially offered by the Department of Electrical Engineering, College of Engineering from 1981 till 1989. The Department of Computer Science was founded in 1989 by merging of the computer science faculty from the College of Engineering and the College of Science. In 2000, a decision to establish College of Information Technology was taken by the Board of Trustees of the University of Bahrain. In 2003, the University established the College of Information Technology and the Department of Computer Science was transferred from the College of Science to the College of Information Technology (CIT).

The number of students registered in the Department increased from 135 in 1991 to 421 in 2012. Accordingly, the number of faculty in the Department increased from 15 in 1990 to 27 in 2013 with an extra three Graduate Assistants currently on scholarship abroad. In addition, the Department has 15 full-time demonstrators who assist in lab and other teaching activities. From the academic year 1990-1991 to 2012-2013, 1404 students have successfully completed their B.Sc. in Computer Science.

1.5 Summary of Review Judgements

Table 2: Summary of Review Judgements for the B.Sc. in Computer Science

Indicator	Judgement
1: The Learning Programme	Satisfies
2: Efficiency of the Programme	Satisfies
3: Academic Standards of the Graduates	Satisfies
4: Effectiveness of Quality Management and Assurance	Satisfies
Overall Judgement	Confidence

2. Indicator 1: The Learning Programme

The programme demonstrates fitness for purpose in terms of mission, relevance, curriculum, pedagogy, intended learning outcomes and assessment.

- 2.1 The programme aims and objectives are linked to the vision and mission of the College. The main programme aims are formulated as a set of Programme Educational Objectives (PEOs) which complement a set of University Intended Learning Outcomes (UILOs) to be achieved by all graduates, namely Communication, Technological Competence, Critical Thinking, Knowledge and Skills, Information Literacy, Responsibility and Integrity, and Life-Long Learning. The mappings of the PEOs to the university strategic goals, UILOs and to the CS department's mission are clearly demonstrated in the SER. The Panel appreciates that the programme aims and objectives are clearly linked to the mission and the vision of the College of IT and of the university itself.
- 2.2 The current BSCS curriculum comprises 132 credit hours and is designed around the university curriculum framework whereby a degree programme has university requirements (11 credit hours), College requirements (28 credit hours) and Department requirements (93 credit hours). Courses required by the College are Language Development I and II, Technical Report Writing, Calculus, Probability & Statistics, Computer Programming I and II, Discrete Structures, Senior Project and Industrial Training. The list of classes required by the CS department is extensive and includes a traditional list of technical classes in computer science. Students are required to take 30 courses with a total of 93 credit hours as department requirements. Students can select four elective courses from a set of elective classes covering a variety of advanced topics in computer science that are offered at the senior level. These include graphics, parallel processing, artificial intelligence, mobile computing, multimedia and hypermedia systems, natural language processing, information retrieval, as well as advanced classes in programming, operating systems and databases. The Panel is of the view that the curriculum would benefit from the inclusion of these recent developments in the IT area as compulsory classes to ensure the currency of the programme. The Panel notes that one class in Chemistry and two classes in Physics are included in departmental requirements. Such requirements do not feature in commonly accepted curricula guidance and the department might want to consider replacing them with topics more relevant to a study of computer science. Overall, the offered courses provide semester-on-semester and year-on-year academic progression with specified pre-requisites, as indicated in the curriculum plan. The Panel appreciates the general organization of the curriculum and finds that there is an appropriate balance of knowledge and skills, theory and practice.

- 2.3 The BSCS curriculum is guided by the set of recommendations published by the Association of Computing Machinery (ACM) and the IEEE Computer Society, and has also been aligned with ABET's 2009-2010 Criteria for Accrediting Computing Programmes. In the view of the Panel that is a good and sound choice. However, the Panel learned during interviews that although ACM/IEEE produced guidance in 2008, the department was unable to accommodate these recommendations. The Panel learned that this is attributed to the slow programme improvement and curriculum changes processes at UOB. While the Panel acknowledges this limitation, the Panel is of the view that some aspects of the curriculum would benefit from updating, especially that a new set of guidance, commonly referred to as CS 2013, is now available. The Panel is pleased that the department, in its self-evaluation report, recognizes the need to take on the findings of the ACM/IEEE report CS 2013. The Panel recommends that the BSCS curriculum be reviewed in the light of the new guidance from ACM / IEEE.
- 2.4 An internationally recognised set of Programme Intended Learning Outcomes (PILOs) has been adopted, and are aligned with the College of IT's mission and the University's mission. PILOs are mapped to University Intended Learning Outcomes (UILOs) as well as to the Program Educational Objectives (PEOs) and are appropriate for a Bachelor of Science degree programme. To improve measurability, PILOs have been refined into Performance Indicators (PIs), which are assessed using a variety of direct and indirect assessment tools. A mapping of courses to PIs exists for the direct assessment of PIs in specific courses. The Panel is pleased to learn that feedback from both internal (PSAC) and external stakeholders (PIAC) was obtained during the development of the PILOs.
- 2.5 A set of Course Intended Learning Outcomes (CILOs) is associated with each course offered by the BSCS department. The CILOs have been revised three times, first in 2008-2009 and again in 2010-2011 and in 2012-2013 to ensure that they reflect appropriate levels of cognitive achievement and that they contribute in a meaningful way to the PILOs. Recently, the level of each course was established by mapping each course with the NQF level descriptors. The Panel appreciates that the mapping between PILOs and CILOs is clearly detailed. However, the Panel observed that these CILOs would benefit from further revision since some of them (e.g. for courses ITCS 315, ITCS 399) still lacked sufficient challenge; moreover there could be more attention to practical activity. The Panel also noted that some course outcomes are expressed as objectives rather than outcomes. For instance, the CILOs for ITCS 315 include 'use interface technology' and for ITC 399 include 'use of various online and library resources'. The Panel recommends that the Department further revise the CILOs to ensure their appropriateness.

- 2.6 The curriculum includes a compulsory senior level class ITCS 482 entitled *Industrial Training*. This requires students to spend a period of eight weeks in an industrial training setting and to produce a written report that is evaluated by a departmental committee. The course is organized by a faculty member at the CS department in coordination with the Career Counseling Office at UOB in order to find suitable industrial allocations for the students. Employers and members of the Industrial Advisory Board interviewed by the Panel expressed their satisfaction with this aspect of the programme. The Panel appreciates that the Department provides the students with the opportunity to be involved in considerable amounts of programming in an industrial environment.
- 2.7 The College of IT has a draft teaching and learning strategy, based on the student-centered model, that ensures that teaching and learning process support the attainment of program learning outcomes and educational objectives. A good range of teaching methods is employed in the delivery of the programme. These include: conventional lectures which tended to be interactive since the maximum class size was 40; practical and laboratory work that embraces problem-solving, pair-programming learning, group work, e-learning, attention to ethical considerations and professional practice; a major senior project; as well as a period of industrial experience. Upon examining course files, the Panel noted that the CILOs are aligned to the teaching/learning activities as well as to the assessment tasks. This was confirmed in interviews with academic staff and students. During the site visit the Panel had demonstrations of Blackboard and Moodle virtual learning environments; these were appreciated by students and were used on most but not all courses to manage the set of materials associated with the delivery of the courses. This typically enables students to have ready access to such matters as the aims of the course, performance indicators, lecture slides, recommended reading, other handouts and support material as well as assessment materials. The Panel was encouraged to note that the University has recently created an e-Learning Centre to support staff in their endeavours toward greater but appropriate and effective use of e-learning. The Panel was also pleased to note that an area for improvement is noted in the SER, namely that there should be 'regular training programs in new and novel teaching methodologies' together with monitoring of the effectiveness of teaching methods.
- 2.8 The College of IT has an assessment strategy that ensures the fair and consistent application of assessment regulations. The assessment guidelines cover all aspects relating to the use of a variety of assessment methods, alignment of assessment methods to ILOs, feedback to students, as well as moderation and grade distribution. A variety of formative and summative assessment methods are used; these typically include class tests, practical activity, projects, quizzes and a formal examination. A Grade Distribution Committee exists with the mandate of ensuring consistency and moderation of assessment. The College has a policy of providing feedback on student

work within a period of two weeks. During interviews, the students confirmed that they receive appropriate and prompt feedback on their assessment results. They also receive immediate oral feedback on their practical work during practical classes; this was typically provided by demonstrators. The Panel notes that it is recognized in the SER that there is a need to improve feedback in the laboratories and to improve formative assessment generally. Overall, the Panel appreciates that the assessment and feedback arrangements are in place and are implemented effectively.

2.8 In coming to its conclusion regarding The Learning Programme, the Panel notes, *with appreciation*, the following:

- The programme aims and objectives are clearly linked to the mission and the vision of the College of IT and of the university itself.
- The curriculum is well-organized and provides an appropriate balance of knowledge and skills, theory and practice.
- An internationally recognized set of PILOs are developed and aligned with the college and university mission.
- Feedback from internal and external stakeholders was obtained in the development of PILOs.
- The mapping between PILOs and CILOs is clearly detailed.
- The students are provided with opportunities to be involved in considerable amounts of programming in an industrial environment.
- A good range of teaching methods is employed in the delivery of the programme.
- The e-Learning Centre supports the faculty in implementing novel teaching methods.
- Appropriate guidelines that cover all aspects of assessments are in place.
- Feedback arrangements on students work are implemented effectively.

2.9 In terms of improvement the Panel **recommends** that the Department should:

- include recent IT developments as compulsory courses in the curriculum to ensure its currency
- further revise the CILOs to ensure their appropriateness
- undertake a review of the curriculum in the light of the recently published ACM / IEEE computer science curriculum guidance, CS 2013.

2.10 **Judgement**

On balance, the Panel concludes that the programme **satisfies** the Indicator on **The Learning Programme**.

3. Indicator 2: Efficiency of the Programme

The programme is efficient in terms of the admitted students, the use of available resources - staffing, infrastructure and student support.

- 3.1 Students admitted to the BSCS Programme must have a high school diploma/secondary school certificate with an average of at least 70% from the science division or equivalent and satisfy the university-wide admission requirements. Students who are weak in oral and/or written English are required to take a one-semester orientation programme. During interviews, the Panel learned that the orientation programme for students is being expanded to two semesters. In addition to English, the expanded orientation programme will focus on mathematics and study skills in order to improve student progression and retention.
- 3.2 As the students admitted to the BSCS Programme have a high-school certificate from the science division, they tend to have basic knowledge in science and mathematics required for completing the entry level courses. In the first semester of 2010 some 190 students were admitted and of these some 121 were female; 62% of the students entered via the orientation / foundation year. In the first semester of 2012 some 116 were admitted, of whom 49 were female; roughly equal numbers of these students entered via the orientation / foundation year and via direct entry to first year. The vast majority of students (typically in excess of 90%) were Bahraini and all students were admitted on a full-time basis. Overall, the number of registered students has declined from about 500 in 2010 to just over 400 in 2012. During this period, the number of males has shown a slight increase while the number of females has declined by almost 100 (approximately 33%). Despite the decline in overall enrolment, the demand for the programme remains strong. The CS department has sufficient physical resources to handle 400+ BSCS students, in terms of classrooms, laboratories, libraries; however, the Panel is of the view that the number of teaching faculty is insufficient.
- 3.3 The CS programme is managed by the chairperson of the Department of Computer Science who is appointed on a rotation basis usually from among the departmental faculty. The chairperson forms 14 committees at the start of each academic year in order to support the management of the programme. The responsibilities of each committee as well as the membership for the past three academic years are listed in the SER and supporting materials. Committee decisions are forwarded to the department chair who may then consult with the Department Council. Departmental decisions are forwarded to the college and university councils as appropriate. During the interviews, it was evident that there are clear lines of accountability and that the faculty members understood the management processes well in general.

- 3.4 The Computer Science Department has three Associate Professors, 16 Assistant Professors, three Lecturers, three Instructors, and five Graduate Assistants. The department's faculty have a wide range of expertise and some faculty members are very active in professional development, research, consultation and publications. A list of the faculty's professional activities over the past five years is provided in the SER. In general, the Panel finds that the faculty members are appropriate for the BSCS programme. The SER states that the department has sufficient staff with a student to staff ratio of 18:1. However, the Panel is of the view that the number of faculty is insufficient to teach the programme courses. This was confirmed during interviews as the Panel learned that some faculty members teach an excessive number of credit hours (up to 18 in the academic year 2012-2013). Although faculty who are assigned an overload are compensated for this overload, the overload reduces the time available for them to pursue activities such as research, which is necessary to remain current in the discipline and is a requirement for professional advancement and promotion. The lack of a significant number of Full and Associate Professors in the department means that (a) leadership roles are filled by Assistant Professors whose time is better spent pursuing activities that would lead to promotion in the professorial ranks and (b) suitable mentors are not available for junior faculty. The Panel recommends that the department increases the number of PhD faculty, particularly Associate and Full Professors for programme leadership and mentorships roles.
- 3.5 The University has clear procedures for the recruitment and induction of academic staff, as evidenced from provided documentation and during interviews with faculty members. Although faculty teaching is evaluated each semester by students, a comprehensive evaluation of faculty performance is conducted by the chairperson only at the time of contract renewal for non-Bahraini faculty members or when staff apply for promotion. During interviews, the Panel was informed that there is a plan to commence annual appraisals of all faculty members. The Panel encourages the college to expedite the finalization and implementation of this draft plan. While the procedures for promotion are fairly clear, the Panel is concerned that it takes approximately three years to process a promotion case from the time a candidate completes his/her portfolio. International norms are to process promotion cases in less than one year. The Panel recommends that the department works with the relevant UOB authorities to reduce the time required to process promotion cases. Retention of distinguished academic staff is accomplished via competitive salary packages, financial support for research projects and attending conferences, and rewards for publishing in international journals.
- 3.6 The department utilizes several university management information systems to enable informed decision making. These include the online advising system, student registration, and human resources. In addition, the College of IT has developed its

own offline advising system to supplement the University's online system. This system was demonstrated to the Panel during the site visit. The supplementary system developed by the College better enables the advising of at-risk students and the assessment of graduation plans. The Panel was informed that the University is in the process of upgrading its online advising system. The Panel suggests that the capabilities of the offline system be incorporated into the upgraded online system. From different interviews, it was evident to the Panel that these management information systems are effectively employed by the department for informed decision making in the management of the BSCS Programme.

- 3.7 Access to learner records is controlled by the Deanship for Admission and Registration. Those authorized to access learner records are required to change their password every 120 days. The approval status of grades is recorded in an audit table. Accuracy of records is ensured by returning all graded work (other than the final exam) to students who can then verify the accuracy of their computer record. Although marked final exams are not returned to students, students may request a re-evaluation. The Panel notes that there are data recovery policies and procedures in place to ensure that all department data are backed up.
- 3.8 During the site visit, the Panel had the opportunity to tour the physical resources available to the CS department, including the classrooms, laboratories, libraries, faculty offices, as well as the e-learning centre. The Panel appreciates that the UOB campus and the CIT building provide an excellent learning environment. The Department has ten classrooms equipped with whiteboards, computers, and overhead projectors and are sufficient in number and capacity for the BSCS Programme. The CS department also has ten laboratories that the students can access daily from 8:00 a.m. until 5:00 p.m. for their practical sessions as well as time for working on their assignments. The Panel learned from interviews that, in addition to the CS department laboratories, the students have full access to the laboratory facilities of the Information Systems and Computer Engineering departments. Moreover, the computing facilities at the open area of IT College are available to all UOB students daily from 8:00 am till 5:00 pm. The Panel notes that although students have access to a sufficient number of general purpose PCs, there is no file server that these PCs can access. This implies that students must either use the same PC at all times resulting in delays when someone else is using that PC or must carry their data on portable media as they move from PC to PC, which, besides being inconvenient, increases the risk of spreading computer viruses and data loss. The Panel is of the view that the use of a shared file server will greatly reduce these problems. The Panel also notes that there are no specialist laboratories to support the teaching of advanced topics such as computer graphics, parallel computing, mobile computing, computer security, and multimedia with the result that the delivery of the curriculum is light on hands-on experience. This needs to be addressed.

- 3.9 Library facilities available to the BSCS students are excellent and the eResources are accessible from off- as well as on-campus locations. During the touring of library facilities, the Panel was informed that the main library stocks 240,000 books and over 80,000 e-books from a number of databases including Ebrary, Mylibrary, DawsonEra, Springer and Elsevier. The main library also provides 25,000 electronic journals from a number of full-text databases including: ScienceDirect, IEEE Xplore ASPP, ACM, JSTOR, Emerald, Cambridge University Press, World Scientific, Oxford University Press and Springer. In addition, there are over 4642 printed books, 2252 fully-searchable e-reference books and 5408 proceedings available to IT College students and teachers from the digital library site. The Panel also learned that the University continues to expand its library holding with the result that the number of articles and books borrowed through inter-library loans has dropped by about 70% between 2010 and 2012. In this same period, the number of library users has increased 30%. Students and staff interviewed by the Panel are overall satisfied with the teaching and learning resources available to them.
- 3.10 The College of IT employs two online systems for tracking various aspects of all computing facilities; these are “*An Online Technical Support System*” to track problems associated with laboratories and “*A Computing Inventory System*” to track utilization of computing equipment. The usage of e-learning resources such as Blackboard and Moodle is tracked by the Zain e-learning centre. The tracking data indicates that the 57 Computer Science courses used either Blackboard or Moodle in AY 2012-2013 and that 90% or more of the user activity was focused in the content and grades areas with the rest being devoted to email, messages, and discussions. The Panel suggests that the Department of Computer Science increases the number of courses that utilize Blackboard or Moodle. Although data on the usage of the library’s digital resources was not available at the time of the Panel’s visit, the Panel learned that the library has recently installed the software needed to collect this data.
- 3.11 The IT College has an online technical support system that students and staff may use to report laboratory problems. A guide with detailed procedures about the use of this helpdesk is available. Students and staff may also seek the assistance of laboratory technicians and IT centre support staff. For practical sessions, the department allocates laboratory technician who are responsible for managing the equipment and assisting the students. During interviews, students indicated that the number of laboratory technicians is not sufficient to meet the growing demand. The Panel recommends that the Department increase the number of laboratory technicians. The Zain e-learning centre provides training on the efficient use of Blackboard and Moodle. The Division of Library Instruction provides information literacy training to faculty and students. Moreover, field-specific instruction on library resources may also be conducted by an Information Specialist assigned for IT College. In addition, the Deanship of Student Affairs provides a range of non-

academic counselling and guidance services to the CS department students, while the Career Counselling Office organizes an annual Careers Day as well as several workshops to prepare students for the labour market.

- 3.12 New students participate in an induction day that is conducted by the University, College, and Department and is held at the beginning of each academic year. During the induction day, the students meet the college dean, the department chairperson, and the academic and social advisors. Information imparted in the induction day is comprehensive, covering an overview of the academic programme, university regulations, facilities, as well as academic and social services. Students are also provided with a handbook that documents the University's regulations, facilities and services available to the students. The same induction procedures are available for students transferred from other institutions. During interviews, the Panel learned that, in response to a stakeholder assessment of the 2012-2013 induction day, the 2013-2014 induction day comprised enhancements such as bi-lingual induction at the college level, induction was scheduled several times during the semester to accommodate schedules, and a session on plagiarism.
- 3.13 Policies and procedures governing at-risk students (students with a GPA below 2.0) as well as general advising procedures are well documented. Upon enrolment, each student is assigned an academic advisor to guide him/her during registration and throughout him/her study period. The Computer Science Department uses the University's online advising system to identify at-risk students as well as an indigenously developed offline advising system to track the progress of at-risk students. The Panel was informed during different interviews that at-risk students are unable to register without advisor approval. The advisor's role is to assist with course selection in order to improve the GPA of at-risk students. The Panel is pleased to note that additional support is available for at-risk students in the form of 'Peer tutoring' as well as workshops conducted by the Office of Students' Advice and Guidance.
- 3.14 The Department provides the students with opportunities to expand their knowledge and experience beyond the classrooms. Informal learning takes place via a series of workshops and seminars organized by the Department. Additionally support is provided for students to attend conferences and competitions both locally and regionally. Between May 2012 and July 2013, 11 workshops/seminars were attended by the department's students. Moreover, a senior project exhibition is organized annually to provide the students with the opportunity to engage with the local community and prospective employers. In addition, the Deanship of Students Affairs organizes an annual competition for the senior project students of the IT and Engineering colleges to encourage creativity and innovation. The Panel appreciates

the range of extracurricular activities provided for the students and encourages the department to sustain these activities pertaining to computer science.

3.15 In coming to its conclusion regarding the Efficiency of the Programme, the Panel notes, *with appreciation*, the following:

- The demand for the programme is strong and the programme attracts a large number of high-calibre students.
- There are clear lines of accountability in the management of the programme.
- Management information systems are effectively employed for decision-making by the department.
- Data recovery policies and procedures are in place to ensure safety of data.
- Academic staff are satisfied with the induction they receive.
- The UoB campus and the CIT building provide an excellent learning environment.
- There is a good number of general purpose computer laboratories equipped with a sufficient number of PCs.
- The libraries facilities are excellent and have a rich collection of IT-relevant resources that are accessible from off-campus.
- An online technical support system 'Helpdesk' is available for staff and students to report laboratory problems.
- A comprehensive induction programme is conducted for new students once a year.
- Appropriate support is provided for at-risk students in the form of peer-tutoring and workshops.
- Informal learning opportunities such as workshops and seminars are available to students.

3.16 In terms of improvement, the Panel **recommends** that the College should:

- increase the number of PhD faculty, especially Associate and Full Professors, particularly for programme leadership and mentorship roles
- implement annual staff appraisal plan
- reduce the time required to process promotion cases
- provide specialist laboratories to serve the teaching of advanced topics
- increase the number of laboratory technicians to meet the growing demand.

3.17 **Judgement**

On balance, the Panel concludes that the programme **satisfies** the Indicator on **Efficiency of the Programme**.

4. Indicator 3: Academic Standards of the Graduates

The graduates of the programme meet academic standards compatible with equivalent programmes in Bahrain, regionally and internationally.

- 4.1 The graduate attributes are clearly stated as PEOs, PILOs and UILOs, in addition to CILOs that are stated for each course. The main mechanisms employed for measuring PILOs are performance indicators and the mapping of CILOs to PILOs. A set of performance indicators (PIs) was developed for each programme outcome, and each measure is assessed using suitable direct and indirect assessment methods. Course portfolios contain information on the mapping of assessment instruments to CILOs in Faculty/Course Self-Assessment forms and CILOs to PILOs in Faculty Course Assessment Report forms. The Panel appreciates that graduate attributes are clearly stated and that they are appropriately assessed.
- 4.2 The SER indicates that the approach used for benchmarking at the IT College and the CS department is to utilize the ABET accreditation process. This was confirmed in interviews with senior management and academic staff. The SER also states that the design of the programme was based on ACM/IEEE curriculum guidelines. In addition, international standards (such as UNDP which involved the British Computer Society and hence the UK benchmark standard for Computing) and the QQA National Qualifications Framework (NQF) have been used as reference points. The Panel could not find evidence of formal benchmarking with leading institutions regionally or globally. The Panel recommends that the Department conducts a formal benchmarking of the BSCS programme at all levels with similar programmes offered regionally and internationally.
- 4.3 The processes for assessment, grading and examination moderation are in place and are well-documented. In addition, an extensive University-Wide Outcome-Based Assessment Process is contained in the IDEAS Handbook. The Panel appreciates how this handbook addresses assessment in a comprehensive manner and encourages on-going training of faculty members in processes described in this handbook. In general, there is sufficient evidence from the provided documents and from site visit interviews that the assessment processes are consistently implemented within the Department.
- 4.4 Achievement of CILOs and of Performance Indicators (PIs) is measured using direct assessment techniques, typically in exams, assignments and quizzes. Assessment forms are in place to ensure the alignment of assessment with outcomes. These forms indicate in which course the CILOs and PIs are being measured. Rubrics have also been developed for the assessment of PIs with performance being at four levels – exemplary, satisfactory, developing and unsatisfactory. The Panel appreciates that

DAC conducts portfolio reviews at the completion of each semester and that corrective actions are being taken based on the most recent assessment of PIs. Within the assessment processes, course outcomes and some of the PILOs are assessed in multiple places and in multiple courses. This results in an amount of data that is difficult to manage. The Panel recommends that the Department review the current assessment practices to increase consistency, reduce the effort required while maximizing the validity of assessment data.

- 4.5 The Department has effective processes in place to review grade distributions of courses at the end of the semester. Moderation of assessment takes place but only after the assessment has occurred; the implication is that findings can be taken into account in subsequent instances of the course. In multi-section courses, there was double-checking of mark entries but this was not practiced in single-section courses. Under 'Areas for Improvements', the SER indicates that there is a need to "Establish a more formal internal examination moderation process for all the courses with immediate feedback to faculty members". The Panel concurs and recommends that the Department establish more thorough internal moderation procedures (including moderation prior to the assessment taking place) to ensure appropriateness of examinations, consistency of assessment plans, and fairness of grading.
- 4.6 The SER states that no external moderation of assessment takes place as the University follows the American university model. This was confirmed during interviews with senior management and academic staff. The Panel nevertheless recommends that the Department adopt external moderation practices as it provides numerous benefits. For instance, increased industrial participation in senior projects would not only provide external input on student performance and appropriateness of curriculum but also create closer ties between the university and industry as well as students and potential employers.
- 4.7 Course files provide evidence that, in general, courses are at the appropriate level, as can mainly be seen in the level of difficulty of the final examinations of courses. This is also further supported by independent external scrutiny, from ABET reviews in 2010 which verified that the assessment is appropriate and valid. The Panel also learned that a UOB student team won the local and regional Microsoft Imagine Cup competitions in 2009 and achieved third place in 2010, which are indications of the quality of the programme and its students.
- 4.8 The level of achievement of the BSCS programme aims/PEOs is determined through employer surveys, alumni surveys, senior exit surveys as well as feedback from the Programme Industrial Advisory Committee. In addition the achievement of the programme ILOs is evaluated both directly through the measurement of performance indicators and indirectly through the mapping of the CILOs to PILOs.

Analysis results of the surveys and the PIs is documented in the SER. The Panel is pleased to note that as a result of these analyses, action plans are drawn up to address areas that require improvement. Discussions of the Panel with alumni and employers indicated a great level of satisfaction of the level of graduates. Moreover, grade distributions provided in course files indicate grading standards comparable to peer institutions.

- 4.9 The SER provides data on dropout rates and retention for the period 2010-2012. The Panel notes that the dropout rate ranged from 8% to 17%. The Panel is of the view that this a comparatively high dropout rate. An analysis of drop-out and retention issues was conducted by the University in 2011 and published under the title "Students' Dropout and Decline in Study at University of Bahrain". The report assessed the importance of factors such as the student-related, staff-related, curriculum-related, and produced a set of recommendations to address the underlying issues. To do a more meaningful analysis, the Panel recommends that the Department conduct a cohort-based analysis of graduation and retention rates.
- 4.10 Work-based learning takes place in the ITCS 492 Industrial Training course, normally undertaken in the summer between semesters 6 and 7. Employers interviewed by the Panel were generally satisfied with this course but indicated that more training could be undertaken by the students (for examples as an elective). Procedures for the management of industrial training are clearly documented and a number of forms are employed; these include a 'Training Establishment Assessment Form', 'Staff Visit Report Form', 'Industrial Supervisor Assessment Form', 'Industrial Training Report Form' and 'Industrial Training Report'. The Panel learned during interviews that although processes are in place, not all students are assigned tasks relevant to their degree during their industrial training. The Panel encourages the Department to develop further the industrial training programme and ensure its effectiveness.
- 4.11 The Senior Project ITCS 499 is a compulsory part of the curriculum. Policies and administrative resolutions that state the responsibilities of both supervisors and students are in place. Moreover, the department established a 'Senior Project Committee' responsible for reviewing project topics, approving project proposals, and evaluating submitted senior projects. During interviews with supervisors and students, the Panel was informed that department organizes a series of seminars to support students in writing and presenting their senior projects. Students were in general satisfied with the level of communication with their supervisors and the support provided to them. The Panel notes that Turnitin software is used for plagiarism detection in the Senior Project; however, from different interviews, the Panel noted that there is some confusion with regard to the percentage of plagiarism allowed in students' work. The Panel encourages the Department to offer more

training courses for the faculty members on the use of Turnitin software, in line with its Plagiarism Policy.

- 4.12 There are two advisory bodies for the programme, a Programme Industrial Advisory Committee (PIAC) and a Programme Students Advisory Committee (PSAC). The PIAC is composed of around ten senior IT managers from the private industry and from the government. The PSAC includes around 10-15 students selected, on GPA basis, from across the different years of the programme. Both committees meet at least once per year and inform programme development. In addition, the department conducts surveys of employers, senior students, alumni to seek feedback on the curriculum. The Panel is pleased to note that a number of improvements have been made in the BSCS programme in light of the feedback of the programme stakeholders.
- 4.13 The Panel met with a number of programme alumni and employers. During interviews, both stakeholder groups informed the Panel that they consider UOB as one of the premier institutions in the country and the region and expressed great satisfaction with the quality of graduates. However, it was also pointed out by these groups that the current curriculum would benefit from the inclusion of recent developments in the IT area. In 2011-2012 the department sent out surveys to employers and alumni to gauge their satisfaction with the graduates from the programme. Some 12 employers and 17 alumni had responded. The results showed general satisfaction that the PEOs had been met but it identified some skills that could usefully be addressed. The Panel was pleased to note that steps had been taken to address these suggestions.
- 4.14 In coming to its conclusion regarding the Academic Standards of the Graduates, the Panel notes, *with appreciation*, the following:
- Graduate attributes are clearly stated and appropriately assessed.
 - The IDEAS Handbook comprehensively describes a university-wide assessment process.
 - There are effective processes in place to review grade distributions of courses.
 - Final examinations are at an appropriate level for a bachelor's degree.
 - The results of the Senior Exit Survey confirm that assessment policies and procedures are being followed.
 - The 'senior Project' is a compulsory part of the programme and policies for its assessment are in place and are implemented.
 - Programme improvements are implemented in light of feedback from the PIAC and PSAC.
 - Alumni and employers are greatly satisfied with the quality of the graduates.
- 4.15 In terms of improvement, the Panel **recommends** that the Department should:

- conduct formal benchmarking of the programme at all levels with similar programmes offered regionally and internationally
- review current assessment practices to increase consistency of the data and reduce the effort involved in managing the data
- establish more thorough internal moderation processes
- adopt a greater role for external moderation
- conduct cohort analysis of graduation and retention rates.

4.16 Judgement

On balance, the Panel concludes that the programme **satisfies** the Indicator on **Academic Standards of the Graduates**.

5. Indicator 4: Effectiveness of Quality Management and Assurance

The arrangements in place for managing the programme, including quality assurance and continuous improvement, contribute to giving confidence in the programme.

- 5.1 University policies, procedures and regulations are published and made available to faculty members and to students on the institution's web site. In particular, academic policies regarding student's admission, progression and transfer are available to all students. In addition, the college uses the intranet system to post all related policies, procedures, and regulations. During different interviews, the Panel learned that it is the responsibility of the dean to communicate new policies, procedures, or regulations to all faculty members, whereas the CS department chairperson disseminates the procedures and regulations that are specific to the CS department. The Panel was also informed that, prior to their adoption, new rules and regulations are made available to all faculty and administrative staff, and they are discussed during department council meetings. The Panel noted from the Senior Exit Survey and confirmed by sampling that the policies, procedures and regulations are properly and consistently applied across the College, a matter verified internally at three levels of Quality Assurance Committees: Department, College and University.
- 5.2 The programme is managed by the department, headed by a Chairperson who is typically distinguished and experienced in higher education. The Chairperson meets regularly with the Department Council which includes all faculty members and which has responsibility for all academic decisions. There is an elaborate committee structure at departmental level to provide support and to report into meetings of the department council. Decisions on important matters such as the approval of a programme have to be ratified at College level by the College Council. In the view of the Panel this system operates effectively.
- 5.3 The quality assurance management system operates at three levels. The department quality assurance is the responsibility of the Departmental Accreditation Committee (DAC); the College of IT has a College Accreditation Committee (CAC) and a Director for the Quality Assurance Office to check the overall quality of the programme; and there is a Quality Assurance and Accreditation Center (QAAC) at University level. The assessment of programmes is outcome-based and focuses on the PEOs, PILOs and CILOs, which are all related and assessed regularly. Each year the Department prepares a self-assessment report that includes data about the operation of the programme, about strengths and weaknesses of the programme, about faculty, and about resources and includes an action plan for improvement. This annual report is submitted to QAAC, which provides appropriate feedback. The CILOs and assessment tools tend to be revised on an annual basis with the PEOs

and the PILOs being revised every three to four years, major changes being based on the yearly assessments. To support the system of reporting, certain formal mechanisms had been put in place. In February 2011, the University Council had approved the Procedure for Programs Quality Assurance, together with the format of the QAAC Self-Evaluation Template and the QAAC Self-Evaluation Improvement Plan Templates. The processes of assessing the CILOs and the PILOs utilize the data obtained from the course portfolios such as the results of assessments and the evaluations of outcomes. The related processes are well defined and their implementation, though not uniformly adhered to, is generally reasonable. Typically the DAC reviews these portfolios. In addition each semester a university level process requires students to complete a course evaluation; statistical information derived from this is sent to instructors and to the Chairperson of the department.

- 5.4 Workshops have been arranged for the academic and administrative staff to increase their awareness on quality assurance matters. At the same time, the Panel noticed discrepancies in the faculty knowledge about assessment procedures and related issues. The Panel was pleased to note that an area for improvement had been identified in the SER, namely providing workshops on quality assurance matters for support staff such as demonstrators, technicians and secretaries. In the view of the Panel, all staff involved with the programme in any way should be familiar with and participate in relevant quality issues.
- 5.5 UOB has recently approved a policy and extensive procedures for the development and approval of new programmes and courses. As these procedures have not yet been implemented at the time of the site visit, the Panel did not have the opportunity to observe the adherence to the policy. The Panel encourages the College to monitor and review the current policy for the development and approval of new programmes and courses, with regards to the efficiency of processes in order to permit timely, yet carefully considered and effective changes to programmes.
- 5.6 As part of the annual programme evaluation, faculty members compile course portfolios for the courses they taught. These portfolios contain assessment reports on the achievement of CILOs. The CILO assessment results are used to measure the PILOs. In addition, PILOs are assessed using a set of Performance Indicators (PIs). This results in a comprehensive set of assessment data points on all courses taught within an academic year. Also the feedback from internal stakeholders (e.g., students, faculty members) is considered and feeds into the improvement process.
- 5.7 The Department periodically reviews programmes using internal and external reviews. The changes to the programme curriculum in 2010 were based on internal surveys and an external reviewer report in 2010. Minor changes suggested after 2010 had been approved. The Panel encourages the Department to more consistently use

feedback from employers about the industrial training as well as the senior project as potentially useful information for programme improvement.

- 5.8 The Department surveys alumni and employers, and uses feedback from a students' suggestion box for improvement and these are available at meetings of the PIAC. The Panel noted that PIAC meetings are scheduled on an irregular basis and suggests that more regular meetings would be worthwhile.
- 5.9 The College of IT provides support for the attendance of faculty members at local and international conferences, seminars, and workshops. A blended learning programme has been offered to develop staff capabilities. The College of IT established a Professional Development Committee in March 2013 to encourage faculty members to develop their skills. The Panel recommends that this newly established College Professional Development Committee should develop a strategy for staff development to measure, evaluate and improve the professional capabilities of faculty staff.
- 5.10 General Studies about higher education and labour market needs have been considered in scoping the labour market. In particular the Tamkeen study of labour market needs and future skills gaps in the market as well as two studies from the Bahrain Higher Education Council have been used. These have resulted in changes such as upgrading ITCS 311 (Systems Analysis) to ITCS 390 (Software Engineering I) and including a course on mobile computing. The Panel was pleased to note in the SER a wish to conduct more regular studies of the labour market as well as the creation of the Business Incubator Center to encourage entrepreneurship skills. PIAC meetings are held to help ensure scoping. The Panel recommends the arrangement of more meetings with the PIAC to discuss the Bahrain and Gulf area markets needs.
- 5.11 In coming to its conclusion regarding the Effectiveness of Quality Management and Assurance, the Panel notes, *with appreciation*, the following:
- Policies, procedures and regulations are published and consistently applied across the college and department.
 - There is an effective management structure within the college and department.
 - There are comprehensive quality assurance processes, which work effectively at the three levels (department, College and University) and work in harmony.
 - A comprehensive set of data is collected on an annual basis and used for programme improvement.
 - The Department uses internal and external reviews to improve the programme.
 - Feedback from stakeholders is formally used for programme improvement.
 - Support is provided for faculty to attend conferences, seminars, and workshops.
- 5.12 In terms of improvement, the Panel **recommends** that the Department should:

- meet more regularly with the Programme Industry Advisory Committee.
- develop a strategy for staff development to measure, evaluate, and improve the professional capabilities of the staff .

5.13 Judgement

On balance, the Panel concludes that the programme **satisfies** the Indicator on **Effectiveness of Quality Management and Assurance**.

6. Conclusion

Taking into account the institution's own self-evaluation report, the evidence gathered from the interviews and documentation made available during the site visit, the Panel draws the following conclusion in accordance with the DHR/QQA *Programmes-within-College Reviews Handbook, 2012*:

There is confidence in the B.Sc. in Computer Science of the College of Information Technology offered by the University of Bahrain.