الهيئة الوطنية
للمؤهلات وضمان 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 Engineering

College of Information Technology

University of Bahrain

Kingdom of Bahrain

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Acronyms

ABET	American Board for Engineering and Technology
ABET CAC	ABET Computing Accreditation Commission
BSCE	Bachelor of Science in Computer Engineering
CAC	College Accreditation Committee
CILOs	Course Intended Learning Outcomes
CE	Computer Engineering
DAC	Department Accreditation Committee
DCE	Department of Computer Engineering
DHR	Directorate of Higher Education Reviews
HEC	Higher Education Council, Kingdom of Bahrain
ILO	Intended Learning Outcome
IT	Information Technology
MIS	Management Information Systems
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, UK
QAAC	Quality Assurance and Accreditation Centre (of UOB)

QQA	National Authority for Qualifications & Quality Assurance of Education & Training
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 (IT) 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 Engineering (BSCE) 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 IT 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 UOB will use the findings presented in this report to strengthen its BSCE. 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 BSCE.

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. in Information Systems. The three programmes were accredited by ABET in 2010. Moreover, the College offers 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 Engineering

The B.Sc. in Computer Engineering (BSCE) programme is offered by the Department of Computer Engineering (CE) within the College of IT at UOB. The programme was originally initiated in the Department of Electrical and Electronics Engineering at the College of Engineering and started admitting the first batch of students in September 2001. In 2003, the College of IT was established and the Computer Engineering programme was transferred to the college as a stand-alone department. The programme was revised in 2010, in line with ABET requirements and ACM/IEEE curriculum guidelines for computer engineering degree programmes.

The number of students registered in the department decreased from 394 in 2010 to 316 in 2012. Although the number of admitted female students was higher than the number of admitted male students in year 2010 by around 17%, in 2011 the number of admitted female students was very close to the number of admitted female students. In the year 2012, the number of males admitted students was higher than the number of admitted female students by around 7%. The number of graduates for 2010, 2011 and 2012 are four, six and two respectively.

1.5 Summary of Review Judgements

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

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 are linked to the vision and mission of the IT College and the University. The main aims are captured in a set of Programme Educational Outcomes (PEOs) which complement a set of university intended learning outcomes expected to be achieved by all graduates. The SER contains mappings that demonstrate how the programme intended learning outcomes contribute to the mission of the College and the University, and to the attainment of the University intended learning outcomes. The Panel appreciates that the programme aims and objectives are clearly linked to the vision and mission of both the IT College and the university .

2.2 The curriculum comprises 135 credit hours achieved through courses required to meet university requirements, courses needed to meet college requirements and courses required by the Computer Engineering Department. The 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. 79 credit hours are allocated for engineering science courses which integrate theory and practice through laboratory experiments and practical projects. The Panel appreciates that there is a year-on-year academic progression and that students are provided with adequate knowledge and skills, theory and practice. The department might want to consider the inclusion of a software engineering course within the programme. There is also a set of elective courses that covers a variety of advanced topics in computer engineering; however, these are available only at the senior level. These include Mobile & Wireless Networking (ITCE 417), Wireless Sensor Networks (ITC 419) and Computer and Network Security (ITCE 431). The Panel notes that one class in Chemistry and two classes in Physics are included in departmental requirements. The department might want to consider allowing for more flexibility in that the students have the choice to replace some of these courses with more technical courses. Students and alumni interviewed by the Panel indicated that the current curriculum would benefit from the inclusion of recent developments in the IT area and more practical activity. The Panel concurs and recommends that the Department enhance the practical aspects of the programme. The Department should also consider including more modern courses appropriate to computer engineering in the local context, to ensure currency and increase employability of graduates.

2.3 The BSCE curriculum is based on the guidelines of the Association of Computing Machinery (ACM) and the IEEE Computer Society. The Panel finds that this is

reasonable; however, these bodies published their latest guidance in 2004, i.e., recent developments have not been considered. The Panel heard consistently in interviews with programme staff that the processes for curriculum changes at the Institution are slow and cumbersome, resulting in the delayed inclusion of new material into the curriculum. The Panel recommends that the Department improve the curriculum review processes so that recent technological advances can be timely incorporated.

2.4 The programme has a set of specified Programme Educational Objectives and has adopted ABET's Programme Learning Outcomes (PILOs). The PILOs are mapped to University Intended Learning Outcomes (UILOs) as well as to the PEOs. The Panel finds that the PILOs are appropriate for a Bachelor of Science degree. However, the Panel noted some inconsistencies in the number (three vs. five) and content of PEOs between the self-study and the College's Catalogue 2013/2014. Moreover, programme aims are sometimes used interchangeably with programme objectives. The Panel encourages the Department to review the programme's documentation to ensure consistency of information and terminology.

2.5 A set of Course Intended Learning Outcomes (CILOs) has been developed for each course offered by the Department. The mapping of the CILOs to the relevant PILOs is clearly documented in the SER. The Panel was informed in interviews that the CILOs are reviewed on an on-going basis to ensure that they reflect appropriate levels of cognitive achievement and that they contribute in a meaningful way to the PILOs. Upon scrutinizing provided evidence, the Panel noted that some CILOs are not at the appropriate skill level, or are expressed as objectives rather than outcomes. For instance, the "CILOs to Question Mapping" of ITCE 362 provided during the site visit has eight knowledge-related outcomes, one outcome that is expressed as a course objective, and only one outcomes that is appropriate for a 300-level course. Another example are the CILOs of the course ITCE 417 as four CILOs are related to knowledge and the other three are expressed as knowledge-related objectives instead of outcomes. The Panel recommends that the Department further revise the CILOs to enhance their appropriateness.

2.6 The curriculum provides the students with an opportunity for work-based learning through the offering of a compulsory course entitled Industrial Training (ITCE 482) that contributes to the achievement of the PILOs. During interviews, the Panel was informed that students are required to complete at least 85 credit hours before undertaking the one-credit industrial training course. Students spend a period of eight weeks in selected industrial training after which they submit a detailed written report that is evaluated by a departmental committee. The Panel appreciates that the College has introduced this opportunity for students to gain workplace experience.

2.7 A good variety of teaching and learning strategies are employed to deliver the curriculum; these include: interactive lectures, laboratory experiments, course projects that require problem solving and group work, a major senior project, as well as industrial workplace experience. This was confirmed in interviews with various stakeholders. During the site visit, the Panel had demonstrations of Blackboard and Moodle Virtual Learning Environments. These are appreciated by students interviewed by the Panel and are used in most but not all courses to manage the set of materials associated with their delivery. Students interviewed by the Panel indicated that the course learning environments enable them to have ready access to the aims of the course, performance indicators, lecture slides, recommended reading, other hand-outs and support material as well as assessment materials. The Panel finds that the implemented teaching methods support the attainment of the ILOs and enhance the attainment of skills of critical thinking, reasoning, analysis, and self-directed learning. The College of IT has a Policy on Teaching and Learning that seeks to encourage the use of current research and scholarship, as well as increased use of e-learning and blended learning while ensuring attention to quality matters. The Panel notes that UOB 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 is also pleased that the improvement plan presented in the SER indicates the intent to solicit resources for further training in new teaching methods.

2.8 The College of IT assessment policies and regulations detail all aspects related to assessment methods, alignment of assessment to learning outcomes, feedback to students as well as grade distribution and moderation. A range of formative and summative assessment methods are employed; these include exams, projects, term papers and quizzes. During interviews, students indicated that they are provided with the assessment methods at the beginning of each course and hence they are clear about what is required of them. Upon examining course portfolios, the Panel noted that the assessment instruments employed are reasonable and appropriately matched to the intended learning outcomes. Students generally receive prompt feedback on their examinations and practical work, although the amount of detail provided varies from one course to another. The Panel is pleased to note that the assessment and feedback processes are administered fairly and efficiently.

2.9 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 vision and mission of both the IT College and the university.
- There is a year-by-year curriculum plan in place that provides academic progression and an appropriate balance of knowledge and skills.
- University, programme and course learning outcomes have been developed and are mapped to each other.

- External curriculum guidelines have been used during the design of the curriculum.
- The Industrial Training course provides the students with the opportunity to gain workplace experience.
- A good variety of teaching and learning strategies are employed to support the attainment of ILOs.
- Well-defined policies for teaching, learning and assessment are in place.
- Assessment and feedback processes on students work are administered fairly and efficiently.

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

- enhance the practical aspects in the curriculum
- improve the curriculum review processes so that recent technological advances can be timely incorporated
- further revise the course learning outcomes to enhance their appropriateness and measurability.

2.11 **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 In addition to meeting the overall university-wide admission requirements, students admitted to the BSCE Programme must have their high-school certificate from the science division or equivalent. Students with weaknesses in oral and/or written English are required to take a one-semester orientation programme. During interviews, the Panel was informed that the orientation programme is being expanded to two semesters. The Panel was pleased to learn that, 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 Overall, the profile of admitted students is appropriate. Students from the science track or technical high schools are enrolled in the programme. The number of registered students has declined from about 394 in 2010 to about 316 in 2012. During this period, the number of males has declined by about 10% while the number of females has declined by about 30%. The Panel was informed in interviews with programme staff that the decline in the number of female students may be related to an increase in other programme options at UOB available to female students. The number of students admitted to the orientation/foundation programme has decreased from 98 in 2010 to 55 in 2012. Despite the decline in overall enrolment, the demand for the programme remains strong and the department attracts high calibre students.

3.3 The programme is managed by the Chair of the Department of Computer Engineering who is assisted by a Department Council and 11 committees. The responsibilities and membership of each committee are listed in the SER. Committee decisions are forwarded to the department chair who may then consult with the department council. Departmental decisions are consequently forwarded to the college and university councils as appropriate. The roles of each council with regard to decision-making are clearly stated in the Amiri Decree 1986 and the Academic Staff Bylaws 2006. During a range of interviews, it was evident that there are clear lines of accountability and that the faculty members understand the management processes well in general.

3.4 The Department of Computer Engineering has two Professors, three Associate Professors, eight Assistant Professors, and seven Graduate Assistants. The faculty expertise is fairly broad and some are very active in professional development activities, and publications. The Panel was informed in interviews that there are three faculty groups aligned with the main orientations within the department,

namely Computer Networks, Circuits and Systems and Digital Systems and Microprocessor. In general, the Panel finds that the faculty members are appropriate for the BSCE programme. The SER states that the student-faculty ratios in the department has improved from 30:1 in the academic year 2010-201 to 21:1 in 2012-2013. However, the Panel is of the view that the number of faculty is still insufficient to conduct the programme activities particularly that some faculty members teach an excessive number of courses/sections (up to four sections/semester in AY 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 might be 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 increase the number of PhD faculty, particularly Associate and Full Professors for programme leaderships and mentorships roles

3.5 In recruiting academic staff for the BSCE programme, the CE department implements the UOB recruitment regulations. The recruitment processes are clearly stated in the SER and were confirmed in interviews with academic and administrative staff. Academic staff interviewed by the Panel expressed their satisfaction with the induction they received upon joining the department. Although faculty teaching is evaluated each semester by students, the Panel learned that a comprehensive evaluation of faculty performance is done only at the time of contract renewal and promotion. There is a plan to commence annual appraisals of all faculty members. The Panel recommends that the College expedite the finalization and implementation of this plan. The retention of academic staff is highlighted as an area of concern in the SER. Attempts to resolve the retention problem include salary increments and rewards for publishing in international journals. 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 College works with the relevant UOB authorities to reduce the time required to process promotion cases.

3.6 The University utilizes several management information systems to enable informed decision making. These include online systems for advising, registration, and human resources. 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.

3.7 The maintenance and securing of data pertaining to students records is accomplished by the CE department, in coordination with Deanship of Admission & Registration, and Deanship of Student Affairs. Those authorized to access learner records are provided with passwords authorized by the Deanship of Admission and Registration and required to change their password every 120 days. The department also implements a documented policy to ensure the accuracy of students' examination results. The approval status of grades is recorded in an audit table. The Panel learned that all graded work (other than the final exam) is returned 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 of their results through an appeal process.

3.8 The Panel appreciates that the UOB campus and the College of IT building provide an excellent learning environment. During the site visit, the Panel toured the physical resources available to the CE department. The department has ten classrooms equipped with overhead networked digital projectors and screens, white boards, and computers with access to Internet. The Panel finds that the classrooms are sufficient in number and capacity for the BSCE programme. The department also has ten laboratories equipped with the required equipment, computers and access to Internet. However, the Panel notes that there are no specialist laboratories to support the teaching of advanced topics such as Parallel Computing and Robotics with the result that the delivery of the curriculum is light on hands-on experience. This needs to be addressed. During interviews, the Panel learned 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 use the same PC at all times resulting in delays when someone else is using that PC. Alternatively, the students 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 encourages the College to use a shared file server to reduce abovementioned problems.

3.9 The students have access to the UOB main library and the College of IT library, both of which have an appreciable collection of resources relevant to the BSCE programme. Overall, the library facilities are excellent and the e-Resources are accessible from off- as well as on-campus locations. UOB 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 interviewed by

the Panel expressed overall satisfaction with available facilities and learning resources. This is confirmed in the Senior Exit survey conducted in the first semester of 2012/2013 which indicates a student satisfaction between 3.8 and 4.8 on a 5-point scale.

3.10 The utilization level of the department's laboratories is monitored every semester to ensure that they fulfill the needs of all courses. The usage of e-learning resources such as Blackboard and Moodle is tracked by the Zain e-learning centre. The tracking data indicates that only 17 Computer Engineering 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. Although data on the usage of the library's digital resources was not available at the time of the Panel's visit, the library has recently installed the software needed to collect this data.

3.11 The Division of Library Instruction provides information literacy training to faculty and students. Library orientation programmes may be set up for new students and faculty by giving a two-day notice. Field specific instruction on library resources may also be arranged. UOB has an online technical support system that students and staff may use to report laboratory problems. Students and staff may also seek the assistance of laboratory technicians and IT centre support staff. Students interviewed by the Panel indicated that the number of laboratory technicians in the CE department is not sufficient to meet the growing demand. This needs to be addressed. There are 14 staff members at the Zain e-learning centre to provide training on the efficient use of Blackboard and Moodle for both staff and students. The Centre also conducts workshops for academic staff on designing and offering their online courses. In addition to academic support, it was confirmed during interviews that the Deanship of Student Affairs provides various support services including social and cultural activities, sports activities, as well as counselling and guidance. A Senior Exit Survey indicates that advising is an issue. The Department has recognized this and has already taken steps to rectify the problem. For instance, during interviews with staff, the Panel learned that students can now only register after having seen their advisor**.** The Career Counselling Office organizes an annual Careers Day as well as several workshops to prepare students for Careers Day. Students interviewed by the Panel expressed their satisfaction with the level of academic and non-academic support provided to them.

3.12 New students participate in well-designed induction programmes at the University, College, and Department levels, held at the beginning of each academic year. The induction is supported by comprehensive documentation including a handbook that documents the University's regulations and facilities. Students who attended the induction programmes informed the Panel that they received information about the

university regulations as well as a tour of the College and department facilities, which they found helpful in easing their enrollment in the College.

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. The 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. At-risk students are unable to register without advisor approval. During interviews with staff and students, the Panel learned that further support is provided to at-risk students through 'Peer tutoring' as well as workshops conducted by the Office of Students' Advice and Guidance. The Panel notes that the College has identified "Improve the advising processes" as an area for improvement and encourages the CE department expedite the implementation of improvement mechanisms.

3.14 The department provides students with adequate opportunities for informal learning including the participation in senior project seminars, training workshops, and conferences. Additional opportunities are also provided by the IT Student Society which conducts regular activities such as programming workshops, "IT Clinic" and IT symposia as well as trips to IT departments in various organizations in Bahrain. Furthermore, the Career Counselling Office organizes workshops to develop soft skills. The Panel is pleased to learn that UOB will host the first GCC Robot Olympiad competition and encourages the College to continue conducting extra-curricular activities pertaining to Computer Engineering.

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

- The programme attracts a large number of high calibre students.
- There are clear lines of accountability in the management of the programme.
- Academic staff are satisfied with the induction they receive.
- Management information systems are effectively used for registration, advising, and human resources.
- The UOB campus and the College of IT 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 have a rich collection of IT-relevant resources that are accessible from off-campus.
- Students are satisfied with the level of academic and non-academic support provided to them**.**
- A comprehensive induction programme is conducted for new students once a year.

- Informal learning opportunities such as workshops and seminars as well as peer tutoring are available to students.

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

- increase the number of PhD faculty, especially Associate and Full Professors, for programme leadership and mentorship roles
- expedite the finalization and implementation of staff appraisal plan
- reduce the time required to process promotion cases
- increase the number of laboratory technicians to support students learning
- provide specialist laboratories to serve the teaching of advanced topics.

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 in the form of programme and course learning outcomes. A range of direct and indirect assessment tools are used to measure the achievement of these outcomes; these include direct assessment, exit surveys, practicum, and final year projects. Information on the mapping of assessment instruments to CILOs, and CILOs to PILOs are clearly documented in course portfolios and in Faculty Course Assessment Report forms. The Panel appreciates that the graduate attributes are clearly stated and that the employed assessment strategies are appropriate for the outcomes being assessed.

4.2 The SER states that the programme considered the 2004 ACM/IEEE Curriculum Guidelines during the design of the programme. During interviews, the Panel was informed that the College's approach for benchmarking is through the implementation of the ABET accreditation processes after which the programme obtained accreditation in 2010. Recently the programme has also used the QQA National Qualifications Framework (NQF) as reference points. No evidence was provided of recent benchmarking of the programme with leading institutions regionally and globally. The Panel recommends that the College conducts a formal benchmarking of the BSCE programme with similar programmes offered regionally and internationally.

4.3 The programme is guided by a set of college-wide regulations for the assessment, grading and moderation developed by a college-level committee. At the site visit, it was evident to the Panel that these regulations are, in general, followed within the department. Staff and students interviewed by the Panel were aware of these regulations as they were regularly communicated to them by the department. Moreover, an extensive University-Wide Outcomes-Based Assessment Process is contained in the IDEAS Handbook. The Panel appreciates how this handbook addresses assessment in a comprehensive manner and recommends on-going training of faculty members in processes described in this handbook.

4.4 The alignment of assessment to learning outcomes is achieved by mapping of assessment to CILOs by the instructor at the end of each course delivery. To improve measurability, PILOs have been refined into Performance Indicators (PIs). The achievement of CILOs and of PIs is measured using direct assessment techniques, typically in exams, assignments and quizzes. The Panel appreciates that assessment plans are in place and are implemented to indicate in which course CILOs and PIs are measured. Rubrics have also been developed for the assessment of PIs. However,

the Panel found some inconsistencies regarding some of the assessment plans. For instance, four different mappings of CILOs to PILOs of ITCE362 (Computer Architecture I) could be found in the SER, in the course file and in the material provided during the visit. Moreover, within the same course, one course outcome is measured in up to 12 places. In addition, some of the PILOs assessed in this course are also assessed in 16 other courses. This results in an amount of data that is difficult to manage. Despite the amount of data collected, there is evidence of low validity of assessment data. An example are the large measurement variations in table "Assessing PILO by CE Courses, Semester 1, Academic year 2012-2013", provided during the visit. The Panel recommends a review of current assessment practices to increase consistency, reduce the effort required while maximizing the validity and usefulness of assessment data.

4.5 The Department has effective processes in place to review grade distributions of courses at the end of the semester. A 'Grade Committee' was established in January 2013 to ensure the implementation of grade moderation regulations. The Panel also learned that draft regulations have been developed whereby each course has an Exam Moderation Committee to review exams prior to being conducted and to review marking of exam papers before they are returned to students. While there was some evidence of internal moderation taking place in multi-section courses, the Panel was unable to find evidence of it in discussions with faculty members in the case of single-section courses. The Panel is of the view that the Department needs to establish a more thorough internal moderation process. The Panel encourages the Department to expedite the approval and implementation of the exam moderation policies to ensure the appropriateness of exams, 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 academic model. This was confirmed during site visit interviews. The Panel nevertheless recommends that the Department adopt external moderation practices to ensure suitable mechanisms for equivalencies of students' knowledge, skills and competencies. External moderation would also provide numerous benefits; for example, 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 Students work scrutinized by the Panel demonstrate an appropriate level of attainment and is in line with the aims and objectives of the programme. This can mainly be seen in the level of difficulty of the final exam of courses. The Panel finds that the academic standards are equivalent to those of similar programmes elsewhere. 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 Department relies mainly on input from alumni, employers as well as the Industrial Advisory Board to determine the adequacy of graduates. PILOs are tested by employer, alumni as well as senior exit surveys to measure the level of achievement of graduates. Discussions of the Panel with alumni and employers indicated a great level of achievement of graduates. Grade distributions provided in course files also indicate grading standards comparable to peer institutions.

4.9 The SER provides data on dropout rates and retention rates for the years 2010, 2011 and 2012. The average length of study in the BSCE programme ranges from 5.1 to 5.3 years. The Panel notes that the retention rate has dropped from 94% in the second semester of 2010 to 87% in the second semester of 2012. The SER also states that the dropout rate at UOB is lower than in other Gulf and Arab universities; however, no data is provided for other universities. Based on the data provided, the Panel notes a comparatively high dropout rate. The Panel was informed in interviews that a study was conducted by UOB to analyse the factors leading to the dropout rates in the different colleges and a set of recommendations were offered to address this issue. To do a more meaningful analysis, the Panel recommends that the College conduct a cohort-based analysis of graduation rates and retention rates using standard definitions.

4.10 Students are provided with the opportunity to undertake work-based learning through the offering of the Industrial Training course (ITCE 482) in summer. Employers interviewed by the Panel indicated that the summer is often a quiet time for work activity in Bahrain and suggested that even more training could be undertaken by the students (for examples as an elective). Appropriate procedures are in place for the management of work-based learning; these are included in the *Training Establishment Assessment Form, Staff Visit Report Form, Industrial Supervisor Assessment Form, Industrial Training Report Form and Industrial Training Report*. Supervisors interviewed by the Panel indicated that they visit their students in the training sites to ensure the appropriateness of the assigned tasks to the students' specializations and to obtain feedback from the employers on the performance of the students. However, the Panel learned during interviews with students and employers that although processes are in place, not all students are assigned tasks relevant to their degree during their industrial training. The Panel encourages the College to further develop the industrial training for the programme and ensure its effectiveness.

4.11 The BSCE programme includes a senior IT project (ITCE 499) which is undertaken as a group work. The criteria for evaluation are clearly defined in the Senior Project

Hand-out that specifies procedures and responsibilities for all stakeholders. Students informed the Panel that they are well motivated and assisted to produce good projects. Projects examined by the Panel at the site visit were good and well-referenced. The Panel was informed during interviews that projects are marked by the supervisor and two others, and sometimes also by an external examiner from industry. However, from the provided project samples, it was apparent to the Panel that supervisors tend to mark high and that overall the project marks are very high. The Senior Project is scheduled for Semester 7 in parallel with four other courses, one of which is an elective. Three more electives are scheduled for Semester 8. The Panel learned that the project often extends over two semesters (i.e., 7 and 8) in practice. The Panel suggests that undertaking electives before the project could allow the knowledge gained from these to feed into the project more effectively.

4.12 Turnitin software is available and used for plagiarism detection in the Senior Project; however, plagiarism detection is currently not effective for programming assignments. A more labour-intensive manual review of student work might be needed to detect plagiarism in courses with programming components. During interviews with academic staff, 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 provide the faculty members with more training on the use of Turnitin software to enable them to tackle plagiarism more effectively across all assessment instruments.

4.13 The Department has a Programme Industry Advisory Committee (PIAC) comprising employers from computer engineering related fields; and a Programme Students Advisory Council (PSAC) comprising eight senior students. The Panel held a discussion with representatives of PIAC and PSAC, which demonstrated the suitability and engagement of its members. Both the PIAC and PSAC are worthwhile initiatives as they provide a formal mechanism for the participation of the employers and students in the improvement of the BSCE programme. The Panel is pleased to learn that suggestions for programme improvements have been made, some of which have been implemented (e.g., inclusion of more networking courses). The Panel appreciates the valuable contribution of both the PIAC and PSAC to the programme. However, the Panel notes that the PIAC and PSAC do not meet as often as intended and hence encourages the Department to engage more regularly with these committees to maximize the benefits obtained.

4.14 The Panel met with alumni of the BSCE programme and a number of employers, many of which are also members of the PIAC. Both stakeholder groups consider UOB as one of the premier institutions in the country. 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 (see section 2.2). An Alumni Survey indicates

general satisfaction with the BSCE programme PEOs. It is unclear if the relatively low score given by Alumni for the preparedness for a successful career and for a positive contribution to society is caused by the programme quality or by the challenge to find suitable employment due to a challenging job market. Employers rated PEOs higher than Alumni, indicating high satisfaction with the programme. This was confirmed when meeting employers.

4.15 In coming to its conclusion regarding the Academic Standards of the Graduates, the Panel notes, *with appreciation*, the following:

- The graduate attributes are clearly stated in the form of programme and course learning outcomes.
- Typical direct and indirect assessment tools are used and are appropriate to measure the achievement of outcomes.
- The IDEAS Handbook comprehensively describes university-wide assessment processes.
- A comprehensive assessment plan has been developed for the programme.
- The level of final examinations is in general appropriate for a Bachelor's degree.
- Appropriate assessment policies for industrial training are in place and are implemented.
- Alumni and employers are involved in the development of the programme
- A detailed handbook for the Senior Project has been developed and is used.
- Alumni are generally satisfied with the programme.
- Employers indicated high satisfaction with the programme's graduates.

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

- conduct formal benchmarking exercises with leading institutions regionally and globally
- review current assessment practices to increase consistency, reduce the effort required while maximizing the validity and usefulness of assessment data
- adopt external moderation practices
- use cohort-based analysis of graduation and retention rates

4.17 **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. During interviews, the Panel learned 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 department chairperson and the college dean ensure the consistent implementation of the institution's policies, procedures and regulations across the college. 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, which is headed by a Chairperson. 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 the departmental level to provide support and to report in meetings of the department council. Decisions on important matters, such as the approval of a programme, have to be ratified at the 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 the 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, highlighting the strengths and weaknesses, as well as 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, formal mechanisms have been put in place. In February 2011, the University Council 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. The Panel appreciates that a comprehensive quality assurance system operates at university, college and department level.

5.4 Workshops are arranged for the academic and administrative staff to increase their awareness on quality assurance matters. At the same time, the Panel found during interviews with staff that there are 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, namely providing workshops on quality assurance matters for support staff such as demonstrators, technicians and secretaries. The Panel encourages the Department to ensure that all staff involved with the programme in any way are familiar with and participate in relevant quality issues.

5.5 The Panel notes that a policy on the development and approval of new programmes and courses has recently been approved by the University Council in October 2013. At the time of the site visit, the Panel did not have the opportunity to observe the adherence to the policy as it has not yet been implemented. The Panel encourages the College to monitor and review the 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, academic staff 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). The Panel appreciates that a comprehensive set of assessment data are collected on all courses taught within an academic year. Also the feedback from internal stakeholders (e.g., students, staff) is considered and feeds into the improvement process. The Panel encourages DAC to revise the matrix of CILOs and PILOs to ensure correctness. The Panel noted that some of the changes suggested based on outcomes assessment are unreasonable. For instance, suggestions made in different documents for ITCE 362 suggest the additional inclusion of material equivalent to at least two more weeks without cutting any other material. The Panel suggests a more

careful approach to making suggestions and their implementation to ensure effectiveness of changes.

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 have been approved. The Panel encourages the Department to more effectively 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, employers, the Senior Project and the PIAC with respect to the three PEOs for the Programme. The Department uses feedback from the stakeholders for programme improvement and this is available for discussion by committee members during PIAC meetings. The Panel noted that PIAC meetings are scheduled on an irregular basis and recommends that more regular meetings are conducted.

5.9 The College provides support for attendance of local or international conferences, seminars, and workshops. A blended-learning programme has been offered to develop staff capabilities. In March 2013, the College established a Professional Development Committee to encourage faculty in developing their skills. The Panel recommends that this newly established committee develop a strategy for staff development to measure, evaluate and improve the professional capabilities of faculty and 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. The programme also utilizes feedback from PIAC to determine Bahrain's and Gulf area markets needs. The Panel was pleased to learn about the creation of the Business Incubator Center to encourage entrepreneurship skills.

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 consistently applied across the college and department.
- There is an effective management structure within the college and department.
- Comprehensive quality assurance processes are in place at department and college level.
- A comprehensive set of assessment data is collected on an annual basis for programme improvement.

- Arrangements are in place for the internal and external review of the programme.
- There are formal mechanisms for using feedback from stakeholders for programme improvement.
- A 'Business Incubator Center' is established to encourage entrepreneurship skills among students.

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

- conduct more regular meetings 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 Engineering of the College of Information Technology offered by the University of Bahrain.