



هيئة جودة التعليم والتدريب  
Education & Training Quality Authority  
Kingdom of Bahrain - مملكة البحرين

# **Directorate of Higher Education Reviews Programme Review Report**

**University of Bahrain  
College of Engineering  
B.Sc. in Chemical Engineering  
Kingdom of Bahrain**

**Site Visit Date: 8–10 May 2023**

**HA074-C3-R074**

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## Acronyms

ABET	Accreditation Board for Engineering and Technology
BQA	Education & Training Quality Authority
CGPA	Cumulative Grade Point Average
CHENG	B.Sc. in Chemical Engineering programme
CILO	Course Intended Learning Outcomes
DHR	Directorate of Higher Education Reviews
HAZOP	Hazard and Operability Analysis
HEC	Higher Education Council
HoD	Head of Department
NQF	National Qualifications Framework
PAC	Programme Advisory Committee
PEO	Programme Educational Objective
PILO	Programme Intended Learning Outcome
QA	Quality Assurance
QAAC	Quality Assurance and Accreditation Center
QAC	Quality Assurance Committee
QAEC	Quality Assurance Executive Committee
SAC	Students Advisory Committee
SER	Self-Evaluation Report
SIS	Student Information System
SO	Student Outcome
UILO	University Intended Learning Outcome
UoB	University of Bahrain

## I. Introduction

In keeping with its mandate, the Education & Training Quality Authority (BQA), through the Directorate of Higher Education Reviews (DHR), carries out two types of reviews that are complementary. These are: Institutional Reviews, where the whole institution is assessed; and the Academic Programme Reviews (APRs), where the quality of teaching, learning and academic standards are assessed in academic programmes within various colleges according to specific standards and indicators as reflected in its Framework.

Following the revision of the APR Framework at the end of Cycle 1 in accordance with the BQA procedure, the revised APR Framework (Cycle 2) was endorsed as per the Council of Ministers' Resolution No.17 of 2019. Thereof, in the academic year (2019-2020), the DHR commenced its second cycle of programme reviews.

The Cycle 2 APR Review Framework is based on four main Standards and 21 Indicators, which forms the basis of the APR Reports of the Higher Education Institutions (HEIs).

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

*Standard 1: The Learning Programme*

*Standard 2: Efficiency of the Programme*

*Standard 3: Academic Standards of Students and Graduates*

*Standard 4: Effectiveness of Quality Management and Assurance*

The Review Panel (hereinafter referred to as 'the Panel') decides whether each indicator, within a standard, is 'addressed', 'partially addressed' or 'not addressed'. From these judgements on the indicators, the Panel additionally determines whether each of the four standards is 'Satisfied' or 'Not Satisfied', thus leading to the Programme's overall judgement, as shown in Table 1 below.

**Table 1: Criteria for Judgements**

<b>Criteria</b>	<b>Judgement</b>
All four Standards are satisfied	Confidence
Two or three Standards are satisfied, including Standard 1	Limited Confidence
One or no Standard is satisfied	No Confidence
All cases where <b>Standard 1</b> is not satisfied	

The APR Review Report begins with providing the profile of the Programme under review, followed by a brief outline of the judgement received for each indicator, standard, and the overall judgement.

The main section of the report is an analysis of the status of the programme, at the time of its actual review, in relation to the review standards, indicators and their underlying expectations.

The report ends with a Conclusion and a list of Appreciations and Recommendations.

## II. The Programme's Profile

Institution Name*	University of Bahrain
College/ Department*	College of Engineering/ Department of Chemical Engineering
Programme/ Qualification Title*	B.Sc. in Chemical Engineering
Qualification Approval Number	Board of Trustees Decision No. (22/1999) dated 29 May 1999
NQF Level	8
Validity Period on NQF	5 years from the date of re-validation
Number of Units*	48 Units
NQF Credit	608
Programme Aims*	<ol style="list-style-type: none"> <li>1. Engage in productive careers in a broad range of the chemical engineering profession in both the public and private sectors including, but not limited to, petrochemical, petroleum refining, gas processing and water.</li> <li>2. Engage in ongoing professional development activities by pursuing graduate studies and /or other learning opportunities.</li> <li>3. Advance in responsibility and leadership in their careers.</li> </ol>
Programme Intended Learning Outcomes*	<ol style="list-style-type: none"> <li>1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.</li> <li>2. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.</li> <li>3. Communicate effectively with a range of audiences.</li> <li>4. Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.</li> <li>5. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.</li> </ol>

	<ol style="list-style-type: none"><li>6. Develop and conduct appropriate experimentation, analyse, and interpret data, and use engineering judgment to draw conclusions.</li><li>7. Acquire and apply new knowledge as needed, using appropriate learning strategies.</li></ol>
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\* Mandatory fields

### III. Judgement Summary

## The Programme's Judgement: Confidence

Standard/ Indicator	Title	Judgement
<b>Standard 1</b>	<b>The Learning Programme</b>	<b>Satisfied</b>
Indicator 1.1	The Academic Planning Framework	Addressed
Indicator 1.2	Graduate Attributes & Intended Learning Outcomes	Addressed
Indicator 1.3	The Curriculum Content	Partially Addressed
Indicator 1.4	Teaching and Learning	Addressed
Indicator 1.5	Assessment Arrangements	Addressed
<b>Standard 2</b>	<b>Efficiency of the Programme</b>	<b>Satisfied</b>
Indicator 2.1	Admitted Students	Addressed
Indicator 2.2	Academic Staff	Partially Addressed
Indicator 2.3	Physical and Material Resources	Partially Addressed
Indicator 2.4	Management Information Systems	Addressed
Indicator 2.5	Student Support	Addressed
<b>Standard 3</b>	<b>Academic Standards of Students and Graduates</b>	<b>Satisfied</b>
Indicator 3.1	Efficiency of the Assessment	Addressed
Indicator 3.2	Academic Integrity	Addressed
Indicator 3.3	Internal and External Moderation of Assessment	Partially Addressed
Indicator 3.4	Work-based Learning	Addressed

Indicator 3.5	Capstone Project or Thesis/Dissertation Component	Partially Addressed
Indicator 3.6	Achievements of the Graduates	Partially Addressed
<b>Standard 4</b>	<b>Effectiveness of Quality Management and Assurance</b>	<b>Satisfied</b>
Indicator 4.1	Quality Assurance Management	Addressed
Indicator 4.2	Programme Management and Leadership	Addressed
Indicator 4.3	Annual and Periodic Review of the Programme	Addressed
Indicator 4.4	Benchmarking and Surveys	Addressed
Indicator 4.5	Relevance to Labour market and Societal Needs	Addressed

## IV. Standards and Indicators

### Standard 1

#### The Learning Programme

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

#### Indicator 1.1: The Academic Planning Framework

*There is a clear academic planning framework for the programme, reflected in clear aims which relate to the mission and strategic goals of the institution and the college.*

#### Judgement: Addressed

- The B.Sc. in Chemical Engineering programme (CHENG), offered by the College of Engineering of the University of Bahrain (UoB), is structured based on a clear academic planning framework that is in line with the academic and administrative bylaws, Regulations for Offering and Developing Academic Programmes and Courses, Quality Manual, and Assuring Learning as described in the provided evidence. The programme has undergone a significant change in 2021 with the introduction of two tracks; B.Sc. in Chemical Engineering – Process Systems, and B.Sc. in Chemical Engineering – Oil and Gas. The Department of Chemical Engineering has been accredited by the United Nations Development Programme (UNDP) in 2005 and reaccredited in 2008, 2014 and 2020. The programme is also accredited by the Accreditation Board for Engineering and Technology (ABET) in 2008 and reaccredited in 2014 and 2020. The Panel is of the view that the programme is fit for purpose and aligned with international standards and practices.
- The Panel noticed that there was no mention in the Self-Evaluation Report (SER) of the identification of potential academic risks and how the Department deals with them. The Panel confirms the existence of annual and periodic reviews which ensure that the quality of the programme, its delivery and academic standards. However, the Panel recommends that the College should introduce a risk register, which includes the risks related to the quality of the programme, its delivery and academic standards, and ensure that such a register is regularly updated, and the identified risks are effectively dealt with.
- The programme's title is concise and clearly addresses the qualification type, level, and content. This is reflected in all the related documents such as the programme's specifications, university's website, transcripts, and certificates. The CHENG programme

adheres to the qualification design requirements of the National Qualifications Framework (NQF), as it was placed on the NQF Level 8 and is commensurate with other programmes of the same nature in terms of course structure and level.

- The CHENG Programme Educational Objectives (PEOs) are highlighted in the Programme Specifications document, mapped to the university's mission, and are regularly revised in line with the requirements of UoB and ABET. The Panel is of the view that the PEOs are aligned with the mission and goals of the College of Engineering which contribute to the achievement of UoB's mission and strategic goals.

### **Indicator 1.2: Graduate Attributes & Intended Learning Outcomes**

*Graduate attributes are clearly stated in terms of intended learning outcomes for the programme and for each course and these are appropriate for the level of the degree and meet the NQF requirements.*

#### **Judgement: Addressed**

- The University Intended Learning Outcomes (UILOs) specify the graduate attributes at the institutional level, which are reflected in the Programme Intended Learning Outcomes (PILOs). At the Department level, the graduate attributes are referred to as Student Outcomes (SOs). The PILOs are clearly stated in the Programme Specifications document, meet the NQF requirements and are accurately mapped to the PEOs and the UILOs.
- The Panel noted that the PILOs are identical to ABET's 1-7 Engineering Programmes Criteria. The Panel also noticed that the PILOs of the programme's two tracks (Process Systems, and Oil and Gas) are identical. Although the PILOs are appropriate for the programme type and level, the Panel recommends that the College should develop separate PILOs for each track (Process Systems, and Oil and Gas), taking into consideration the differences between these tracks.
- All the Course Intended Learning Outcomes (CILOs) are well written, measurable and appropriate for the level of the courses as evidenced in the course syllabi and the assessment sheets. The CILOs are also appropriately mapped to the PILOs and reflect the topics and contents of each course.

### **Indicator 1.3: The Curriculum Content**

*The curriculum is organised to provide academic progression of learning complexity guided by the NQF levels and credits, and it illustrates a balance between knowledge and skills, as well as theory and practice, and meets the norms and standards of the particular academic discipline.*

#### **Judgement: Partially Addressed**

- The CHENG programme has 137 credit hours spread over a four-year period. The programme is tailored in a similar way to other similar programmes both regionally and internationally, with a blend of theory, practice, knowledge, and skills components. In this respect, there is also evidence for ABET accreditation, consultation with the relevant stakeholders, and benchmarks conducted by the Department.
- The Panel examined the Programme Specifications and Course Specifications and found that the curriculum is organised to provide academic progression of learning complexity and illustrates a balance between knowledge and skills as well as theory and practice. The course contents cover the expected elements in term of depth and breadth. However, there is a distinct lack of biological related training, as there is only one course in this field, 'Introductory Biology for Engineering' (BIOLS261). The Panel recommends that the College should include more biological training for students, particularly in the areas of biological reactor design, wastewater treatment, and/or fermented food manufacturing.
- The Panel noticed that the 'Process Safety' (CHENG465) course is an elective, while safety is an essential skill required by all chemical engineers and should be incorporated in the compulsory courses. The Panel, hence, recommends that the College should add the 'Process Safety' (CHENG465) course to the compulsory courses and ensure that all students are introduced to safety engineering, including Hazard and Operability Analysis (HAZOP).
- The CHENG curriculum comprises appropriate theoretical course contents combined with laboratory and project work. Almost all courses in the 300 and 400 levels, require students to work in groups on real-life case projects involving direct interaction and feedback from the industry. Students are also asked to submit technical reports and give presentations, to enhance their communication skills. During the interviews with alumni, the Programme Advisory Committee (PAC) and employers, the Panel concluded that graduates possess very strong theoretical skills but lack the necessary soft skills (e.g. communication and leadership skills). Furthermore, the Student Advisory Committee (SAC) and PAC recommended enhancing the practical skills of graduates by equipping laboratories with latest advanced technologies (see Indicator 2.3). In the same vein, the Student Exit Survey of 2021-2022 revealed low satisfaction score ranging from 61.4% to 78.8%, with the low score being for access to practical sessions. The Panel recommends that the College should review the delivery of English communication skills of students, and their leadership and managerial skills throughout the programme with the aim of improving these soft skills, in addition to increasing students' access to practical sessions to further enhance their practical skills.
- The textbooks and references listed in the course syllabi are appropriate to the taught courses. However, there are several instances where the book editions are old (some date

back to 1997). Therefore, the Panel recommends that the College should review the course syllabi and update the textbook and reference sections with recent book editions.

### **Indicator 1.4: Teaching and Learning**

*The principles and methods used for teaching in the programme support the attainment of programme aims and intended learning outcomes.*

#### **Judgement: Addressed**

- The programme adheres to the university's Teaching and Learning Policy, approved in 2018, which includes suitable teaching and learning methods. The teaching methods employed include lectures, class discussions, problem-based learning, case-based learning, reflective learning, design projects, field trips, and industrial placements. These teaching methods are appropriate to the PILOs and the CILOs and are aligned with the institutional teaching strategies. The Panel is of the view that the employed teaching methods are sector standard and foster critical thinking, problem solving, and reasoning.
- The Department has developed e-learning practices especially during the Covid-19 period where online teaching has been applied. As per the SER and the provided evidence, the academic staff uses MS Teams, Blackboard and other online tools to support their teaching. UoB has also issued Quality Assurance Guidelines for Precautionary Period, where clear guidelines are included for the online teaching, learning and assessments.
- It was evident during the interviews with faculty and senior management that the students get exposed to wide engineering practices through seminars and site visits as part of their lifelong learning process. UILO 6 'Life-Long Learning' was not specifically mapped in the programme, but the updated 2022 programme specifications map this UILO to SO7 which is sensible. Furthermore, real-life applications in the form of project courses allow the students to demonstrate their design skills, which are evaluated by the faculty and industrial advisor from the local industry. In addition, after completing 85 credit hours of course work, students must spend at least six weeks of industrial training, working on real industrial problems.
- The curriculum clearly enables the concept of learning by use of formal, informal, and non-formal learning activities, particularly with respect to industrial focus on project courses, additional workshops and seminars by local industrialists, involvement in outreach activities with alumni and local industry. Furthermore, students participate in laboratory activities which are often evolved into quality research papers that are formally published. The Panel appreciates the variety of life-long learning activities provided to students.

## Indicator 1.5: Assessment Arrangements

*Suitable assessment arrangements, which include policies and procedures for assessing students' achievements, are in place and are known to all relevant stakeholders.*

### **Judgement: Addressed**

- The programme adheres to several assessment policies and procedures, which are specified in the Regulations of Study and Examination, Moderation of Assessment Regulation, Teaching and Learning Policy and Assuring Learning. In addition, the University-wide Assessment Handbook summarises the outlines and rationale for UoB's Outcomes-Based Assessment Process and describes the step-by-step implementation of such assessment. All assessment policies are available online for all stakeholders and follow standardised processes in the classroom, laboratory or externally. Overall, the Panel is satisfied with the CHENG assessment framework.
- The course syllabi documentation provides a breakdown of the assessment methods used, a learning schedule, and the mapping of the CILOs to PILOs and SOs. Students are given course syllabi at the beginning of each semester with clear grading schemes. Marking criteria are defined for coursework and groupwork and students are provided with prompt feedback on their progress.
- Student assessment takes place in both formative and summative practices and *via* a suitable range of methodologies. The Panel notes that the marking process is transparent and fair. Discussions with faculty indicated that failure is redeemed by retaking courses where appropriate and an exit 'Diploma' qualification is available if needed. Evidence of internal and external moderation of courses which reviews the appropriateness of assessment was provided.
- The CHENG programme follows the Anti-Plagiarism Regulations, Study and Examinations Regulations and Students Misconduct Bylaw, which provide further details for the disciplinary action and student appeal process. During the interviews with the senior management, it was confirmed that cases of cheating are taken seriously and referred to the Student Misconduct Committee. Students have the right to appeal as supported by the provided evidence.

## Standard 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 2.1: Admitted Students

*There are clear admission requirements, which are appropriate for the level and type of the program, ensuring equal opportunities for both genders, and the profile of admitted students matches the program aims and available resources.*

##### **Judgement: Addressed**

- As per the SER, the CHENG programme adheres to the university's Admissions Policy, which clearly outlines admission requirements. The Admissions Policy does not discriminate on the basis of gender and accommodates students with special needs. The Policy is consistently implemented according to the statistics over the past five years and is made public. The Policy requires a minimum Cumulative Grade Point Average (CGPA) of 70% in the Secondary School certificate from all applicants. The SER mentions the use of an aptitude test, and evidence was provided on the rubric used for the aptitude test; however, according to the SER, the validity of such a test has yet to be investigated. Thus, the Panel advises that the results from the aptitude test be reviewed periodically for appropriateness and validity.
- There is evidence of an orientation programme for newly admitted students. As per the Admissions Policy, all accepted students take a one-semester orientation programme, which includes English language courses. Students with CGPA of 90% and above in the secondary school certificate are exempted from the orientation programme. Exemptions are also granted for students who have passed the TOEFL test with 500+ points or equivalent. During the interviews, the Panel was able to confirm that remedial support measures are in place and adequate.
- As per the SER and the Study and Exam Regulations, credit transfer is allowed for students if he or she has completed a comparable course with a minimum grade of C. However, statistics shows that there were no transfer students during the last five years.
- According to the SER, UoB routinely examines the admission requirements based on current student performance and regional and international benchmarks. The aptitude

test is an example of a recently adopted modification. As shown from the provided evidence, the Admissions Policy was last revised in 2022.

## **Indicator 2.2: Academic Staff**

*There are clear procedures for the recruitment, induction, appraisal, promotion, and professional development of academic staff, which ensure that staff members are fit-for-purpose and that help in staff retention.*

### **Judgement: Partially Addressed**

- As per the SER, UoB has adequate policies and regulations for the recruitment, induction, appraisal, and promotion of academic staff, which are consistently implemented in a transparent manner. According to the SER, the faculty evaluation form has been incorporated into the annual evaluation procedure of the Civil Service Bureau. The faculty promotion is based on the performance and significant accomplishments of the faculty in teaching, research, and services. The SER states that several faculty members have submitted applications for promotion. Nonetheless, at the programme level, only one faculty member has been promoted since 2018.
- The SER mentions that the Department encourages the faculty to conduct quality scientific research and cites some evidence, which were either empty folders or irrelevant. There is no evidence that either the College or the Institution have a research plan, and this was confirmed during interviews. However, the Panel noticed the existence of policies for both internal and external funding for the faculty research. Furthermore, the Panel found that the faculty evaluation form focuses on the quantity of publications rather than the quality. Therefore, given that research is a pivotal element for promotion, the Panel recommends that the College should develop a research plan that is aligned with the college strategic goals, mission, and vision; devise a clear procedure to ensure that quality scientific research is carried out by faculty members; and set a plan to encourage faculty to apply for promotion.
- There are 18 full-time faculty employed in the Department of Chemical Engineering. One lecturer, five Assistant Professors and 12 Associate Professors, in addition to nine part-timers. Among these faculty members, 11 are dedicated to CHENG programme, three are solely dedicated to Process Instrumentation and Control Engineering programme and 10 serve for both programmes. As was evident from interviews and the provided curriculum vitae, faculty members cover appropriate range of academic credentials, specialisations, and professional experience.
- As per the SER, students to faculty ratio in the academic year 2020-2021 was 38:1 with part timers, and 58:1 without part timers, which is considered high and was identified as the most pressing risk during the interviews. During the virtual visit, the Panel noticed a clear effort to recruit faculty, but the funding constraints and hiring restrictions were the main

impediments. Overall, the Panel supports the department plan for recruiting new faculty members with the outmost urgency and recommends that UoB should urgently expedite the implementation of the Department's plan to recruit faculty members at the Department of Chemical Engineering.

- There are suitable processes for recognising and supporting all faculty's ongoing professional development. The provided evidence contains several requests for identifying faculty development needs at the college and university levels. A good number of workshops, training and development opportunities have been organised over the last four years. Activities of induction of new faculty and part timers are also reported. During the interviews, the Panel noticed that support to attend conferences and workshops is available, as well as research funds based on research proposals.
- The SER does not refer to any measures in place to monitor staff turnover and ensure the retention of highly qualified academic staff. The provided evidence includes the College statistics over the last five years, not the Department. However, during the interviews, the Panel learned that one faculty member had retired in the past five years. Nonetheless, the Panel recommends that the College should monitor the staff turnover and ensure the retention of highly qualified academic staff members.

### **Indicator 2.3: Physical and Material Resources**

*Physical and material resources are adequate in number, space, style and equipment; these include classrooms, teaching halls, laboratories and other study spaces; Information Technology facilities, library and learning resources.*

#### **Judgement: Partially Addressed**

- The SER and the supporting evidence describe and detail the several facilities of the programme including, classrooms, meeting rooms, computer laboratories and offices for academic and non-academic staff, which are equipped with computers, projectors, and interactive whiteboards with direct Internet connectivity, as noticed during the on-site campus tour. During the interviews with stakeholders, the Panel observed a reoccurring issue regarding malfunctioning or outdated equipment, in addition, the interviewees referred to the practical work as a concern, due to the quantity and state of repair of some equipment, which is substandard, besides, students are often loaded up on one single workstation. The Panel, therefore, recommends that the University should develop and expedite the implementation of a plan for the acquisition of sufficient modernised equipment.
- In addition to the Central Library at the UoB Sakhir campus, there is an Engineering Library located in the Isa Town campus, where the CHENG programme is offered. Access is provided to these libraries and the digital library catalogue and portal, which is

accessible within the library or remotely. The Panel appreciates that the Engineering Library is well-equipped with e-books and electronic journals which support the teaching, learning and research needs of the CHENG faculty and students.

- With regard to the maintenance of the resources, evidence was provided on outfitting the computer laboratories with the course's required software, which are regularly updated. During the on-site campus tour, the Panel noticed that the Air Condition system is not working in certain buildings, and due to this problem, the chemicals had been safely moved to other places. The Panel also observed that certain buildings were not well-maintained, and toilets are not equipped for students with the special needs. Therefore, the Panel recommends that the University should expedite the implementation of a plan for addressing building maintenance, particularly of the Air Condition system, and provide suitable toilets for students with special needs.
- The health and safety of students and faculty on campus is ensured by health and safety measures. The Facilities and Occupational Health and Safety Committee looks over the health and safety of students and staff. During the on-site campus tour, the health and safety signs and instructions were well displayed and clear. The Panel is of the opinion that these policies and measures are appropriate and adequate.

## **Indicator 2.4: Management Information Systems**

*There are functioning management information and tracking systems that support the decision-making processes and evaluate the utilisation of laboratories, e-learning and e-resources, along with policies and procedures that ensure security of learners' records and accuracy of results.*

### **Judgement: Addressed**

- UoB has an effective Student Information System (SIS), which is used to record and manage information regarding students' admission, registration and progression, as well as course evaluations, approval of grades, grade appeals and academic advising. The SIS generated reports are used by academic and administrative staff for academic planning and decision-making purposes. In addition, students and staff have also access to a learning management system, Blackboard, where all the courses material are posted. However, the Panel was not provided with evidence to support that laboratories utilization, e-learning and e-resources are tracked and used to take informed decisions. Thus, the Panel recommends that the College should ensure that generated reports of the utilisation of laboratories, e-learning and e-resources are used to inform decision making.
- There are policies and procedures in place to ensure the security of learners' records and accuracy of results. Students' records are kept with the Deanship of Admission and Registration, and no modification is permitted outside the formal procedure. Moreover, Students data is stored safely in the Information Technology Center, which houses

electronically archived documents. During the virtual site visit, the Panel was informed that the awarded certificates and transcripts are accurate and issued in a timely manner, usually 1-2 days.

## **Indicator 2.5: Student Support**

*There is appropriate student support available in terms of guidance, and care for students including students with special needs, newly admitted and transferred students, and students at risk of academic failure.*

### **Judgement: Addressed**

- During the interviews with faculty, the Panel learned that the College doesn't have enough number of technicians to support laboratory work due to budget limitations and it was clear to the Panel that the College is aware of this lack. The Panel was informed during interviews and the on-site campus tour that a laboratory technician had been laid off due to budgetary restrictions and that the whole College has only 10 technicians and four demonstrators, who cannot sufficiently fulfil the needs of all programmes and students of the College. This is in addition to the lack of administrative staff to serve the Department. Therefore, the Panel recommends that the College should urgently develop and implement a plan to recruit more laboratory technicians and staff to assist with the administrative work at the Department.
- The Students Rights Regulations define a student rights charter and describe the university's available facilities, resources, guidance, and care. At the beginning of each academic year, newly admitted students are provided with two induction days that are organized by the Deanship of Students Affairs at the institutional level and the College of Engineering. The SER did not provide information about career guidance services; however, the Panel was informed during the interviews that the departmental Industrial Training Coordinator, who is also a member of the College of Engineering Industrial Training Committee, prepares students and counsels them on different matters, such as career opportunities, job searching, ethical responsibility, and success strategies.
- As per the evidence provided, each student is assigned an academic advisor to monitor his/her academic progress and achievements. Students with special needs are also supported through their academic advisors in conjunction with the Guidance and Counseling Department of the Deanship of Students Affairs. The advisor has access to all pertinent information, such as registered courses, transcript, and grade point average. Students are considered 'at risk' if their CGPA is below 2.30. In such cases, students are required to meet more often with their academic advisors who follow-up their progress with the course instructors. According to the Annual SER, in the academic year 2021-2022, around 7.7% of the students were at risk of academic failure. However, the Panel discussions with students during the interviews indicated that some students rarely meet

or interact with their academic advisor. The Panel advises the College to encourage academic advisors to engage with students at least once per semester.

- Surveys are used to assess the students' satisfaction with the provided support services. The results of these surveys show that students are generally satisfied and are benefiting from the different support services provided by the College and the University.

## Standard 3

### Academic Standards of Students and Graduates

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

#### Indicator 3.1: Efficiency of the Assessment

*The assessment is effective and aligned with learning outcomes, to ensure attainment of the graduate attributes and academic standards of the programme.*

##### **Judgement: Addressed**

- Assessment methods, as described in the course specification, are suitable to evaluate the theoretical and practical courses and escalate in complexity in higher-level courses. These include quizzes, tests, activities, presentation, reports, and examinations. The Panel is of the view that the nature of the assessments employed meets the sector standard. In addition, the Panel was provided with sufficient evidence to demonstrate that the assessments are mapped and aligned to the PILOs, UILOs, and SOs.
- The Panel notes that there are appropriate mechanisms in place to evaluate the achievement of the SOs and the PILOs through the assessment of the CILOs and the surveys. The Panel is satisfied with the mechanisms used to monitor and improve assessments. These mechanisms include the internal and external moderation processes, quality audits conducted by the Quality Committee at the college level and the annual self-evaluations conducted at the department level.

#### Indicator 3.2: Academic Integrity

*Academic integrity is ensured through the consistent implementation of relevant policies and procedures that deter plagiarism and other forms of academic misconduct (e.g. cheating, forging of results, and commissioning others to do the work).*

##### **Judgement: Addressed**

- There is a clear Anti-Plagiarism Policy which specifies the definition of misconduct, penalties, and procedures for both detection and disciplinary actions. In addition, the Student Misconduct Bylaws provide further detail for the disciplinary actions and student appeal process. Students are introduced to these policies and regulations during their

induction at the university and the college levels and in the introductory session of each course.

- Evidence of active monitoring of academic integrity was provided. Students are required to submit their work through the Turnitin plagiarism detection software, examinations are invigilated, and a reporting mechanism is in place for suspected misconduct. Evidence was also provided for misconduct cases and these were resolved in line with the policies.

### **Indicator 3.3: Internal and External Moderation of Assessment**

*There are mechanisms in place to measure the effectiveness of the programme's internal and external moderation systems for setting assessment instruments and grading students' achievements.*

#### **Judgement: *Partially Addressed***

- The Moderation of Assessment Regulations and the Study and Examination Regulations depict the process of moderation, which includes internal pre-assessment moderation, internal post-assessment moderation and external-post assessment moderation. The Panel notes, however, that the moderation policies and regulations do not include detailed procedures related to the appointment and approval of external moderators. Therefore, the Panel recommends that UoB should revise the policies and regulations related to external moderation to include clear criteria for the appointment and approval of external moderators.
- Discussions with faculty and senior management indicated that moderation and review of courses is taking place on a very ad-hoc basis and is not happening for all courses within the programme. Internal moderation forms for a number of courses demonstrate that internal moderators conduct a review of the marking guide and model answer for each assessment, and a sample of assessed work. The Panel examined the submitted internal moderation form samples and noticed that this is mostly a tick-box exercise with no actual feedback comments provided for the review. An example of an external moderation form for a single course related to the Process Instrumentation and Control Engineering programme was provided, which requires the external moderator to review a specific course only. The review encompasses the course materials, examination, examination model answers, and a sample of assessed work. Again, this was mostly a tick-box exercise, however, there was minor feedback text available. Therefore, the Panel recommends that the College should ensure that internal and external moderation is done for all course assessments and encourage both the internal and external moderators to add their written feedback on the moderation forms.
- As per the SER, the findings of internal and external moderators are communicated to the course coordinators, which in turn communicate these findings to the Moderation

Committee and subsequently to the Quality Assurance Committee (QAC) at the department level, which monitors the moderation process to ensure its effectiveness and the continuous improvement of the CHENG programme and its courses.

### **Indicator 3.4: Work-based Learning**

*Where assessed work-based learning takes place, there is a policy and procedures to manage the process and its assessment, to assure that the learning experience is appropriate in terms of content and level for meeting the intended learning outcomes.*

#### **Judgement: Addressed**

- Work-based learning is covered in the 'Industrial Training' (CHENG390) course and carries a pre-requisite completion of 85 credits. The course has clear CILOs, which effectively contribute to the achievement of the PILOs. As indicated in the course syllabi, all students are required to complete 300 hours of supervised training in an approved training place. Students can also be exempt from the industrial training if they have equivalent industrial experience. The Internship Training Guidelines clearly detail the policies related to the industrial experience including roles and responsibilities of relevant parties. However, the guidelines state that an internship should last a minimum of eight weeks (i.e., 35 hours per week). This is a total of 280 hours and not the 300 hours specified in the course syllabi document. The Panel suggests that the Internship Training Guidelines and course syllabi are reviewed to ensure consistency.
- The Panel notes that assessment methods of the Industrial Training course are appropriate and include reports and presentations that are assessed by the course supervisors. The Panel confirmed during the interviews that the students and internship supervisors evaluate the internship course through surveys to improve the work placements experience.
- Interviews with external stakeholders including alumni and internship providers indicate that there is a suitable availability of placements; roles and responsibilities are clear; feedback and assessment are collected; and that, overall, the experience is highly rewarding. In many cases, the industrial placement leads to direct employment. Therefore, the Panel appreciates the interaction between faculty, alumni and local industry, which leads to students' employment after their graduation.

### **Indicator 3.5: Capstone Project or Thesis/Dissertation Component**

*Where there is a capstone project or thesis/dissertation component, there are clear policies and procedures for supervision and evaluation which state the responsibilities and duties of both the*

*supervisor and students, and there is a mechanism to monitor the related implementations and improvements.*

**Judgement: *Partially Addressed***

- Discussions with faculty indicated that the capstone projects are divided into two courses, a 'Chemical Plant Design' (CHENG422) course and a 'Senior Project' (CHENG 490) course. The Panel is of the view that both courses do not sufficiently meet the requirement for a capstone design project. A design project would typically contain detailed hand calculations to confirm the computer simulation data, a mechanical or physical design, a risk assessment (including HAZOP), an environmental impact assessment, and a more rigorous estimation of the plant economics. Internationally, there is no direct comparison to these two courses, as many institutions favour the 'design project'. Therefore, the Panel recommends that the College should review the two courses of the capstone projects with the aim of merging them to produce a formal design project course that covers technical, economic, and environmental requirements in-line with international standards.
- The responsibilities of the students and supervisors for the capstone projects are clearly defined in the SER. As per the SER, students are well-informed of the procedures and the criteria for submitting their projects during the course lectures. Though, the Panel advises the College to include all the regulations and procedures related to the capstone projects in one document and to ensure that it is accessible to students and supervisors in printed form and on its website.
- Although 'Chemical Plant Design' (CHENG422) course and 'Senior Project' (CHENG490) course are mapped to SO2 and SO4 and their reports show a good level of technical design; they are lacking significant components related to public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. A sample of two reports of 'Chemical Plant Design' (CHENG422) course were provided, but no reports were provided for 'Senior Project' (CHENG490) course. One report, titled 'Plant 2 Final Report Group 1' contains a very minor section on process costing, and the other report had nothing in this area. None provide HAZOP analysis or any safety engineering. Based on the evidence provided, there is not enough rigour in the reports to demonstrate the achievement of SO2 and SO4. Therefore, the Panel recommends that the College should ensure that the work required from students in the capstone projects is reviewed and coordinated to ensure that Student Outcomes (SO2 'an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors' and SO4 'an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts') are being emphasised.

- Based on the SER, the capstone project is evaluated by the project supervisor (50%), two internal examiners (40%) and one external examiner (10%). Students are also required to submit a poster and a presentation as part of their viva-defense. In addition, there is a dedicated committee to oversee the implementation of the regulations and procedures related to these projects.
- The Panel notes that the progress of the students in their capstone projects is regularly monitored by their supervisors. During the interviews, students confirmed that their progress is regularly monitored, and feedback and guidance are given to them throughout the duration of the projects.

### **Indicator 3.6: Achievements of the Graduates**

*The achievements of the graduates are consonant with those achieved on equivalent programmes as expressed in their assessed work, rates of progression and first destinations.*

#### **Judgement: *Partially Addressed***

- Several examples of students' assessed work from different course levels were provided, which demonstrate that the grading is consistent with the quality of work submitted; and indicating that the achievements of students are in general appropriate. However, the Panel was not satisfied with the quality of some of the capstone projects which were below the standard that would be expected.
- Statistics related to student numbers entering, progressing, and graduating the programme were provided. The data indicates that Chemical Engineering is one of the larger programmes in terms of student cohort. The statistics presented in the provided evidence, also show that the average time to complete the programme is around five years with a maximum of seven and a minimum of around 4.5 years, while the total number of registered students is going down. The number of graduates after five years is almost 2/3 of the admitted students. In addition, according to the Annual SER of the academic year 2021-2022, 41 students are either dismissed or canceled. During the visit, the Panel confirmed that the student dropout rates and withdrawals are high. The Panel was also informed that there is a plan to introduce a diploma degree as an exit strategy for low-performing students. The Panel recommends that the College should monitor the student failure rate and the number of students withdraw or exit with the new Diploma qualification with the aim to understand the root cause of the lower student outcome.
- Tracking information for graduates is available from 2007 to present. It indicates that the post-graduation destination for many students is into various academic, industrial, and business roles, from progression to advanced degrees; engineering positions in various companies; and positions in other business sectors. The 'Alumni and Employer Survey

Report of 2021-2022' indicates that the employment percentage of the graduates is 100%, 60%, and 54% for the last three years. This is concerning and indicates that almost half of the graduates from the last two cohorts are not employed. The report indicates that employers are generally satisfied with the programme graduates.

## Standard 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.*

#### Indicator 4.1: Quality Assurance Management

*There is a clear quality assurance management system, in relation to the programme that ensures the institution's policies, procedures and regulations are applied effectively and consistently.*

#### Judgement: Addressed

- Quality Assurance (QA) of the CHENG programme adheres to the guidelines, procedures and regulations defined in the UoB Quality Manual, which guides the Dean, Head of Department (HoD) and faculty members. In addition, the Programme Quality Assurance and Enhancement Policy supports the university's education strategy where the main purpose is to assure and enhance programme evaluation procedures. The Panel notes that these policies and regulations are recent and regularly updated as evidenced by the version number and dates stated on the provided documents. During the interviews, the Panel confirmed that QA policies and procedures are well-communicated to all stakeholders including UoB administration, faculty members, the PAC and the SAC.
- As described in the Quality Manual, QA practices are governed by the Quality Assurance and Accreditation Center (QAAC), which coordinates and supports quality assessment efforts across all UoB's colleges through the Quality Assurance Executive Committee (QAEC). At the College level, the College Quality Assurance Office Director, who is a member of the QAEC, is in charge of implementing the QA system across all programmes. The Director regularly meets with the coordinators of the department QAC to ensure that QA standards are consistently met across all programmes.
- During the interviews, faculty members and staff demonstrated a high level of QA awareness and execution. In addition, the Panel was informed that QA awareness sessions, QA YouTube videos, and compulsory inductions are provided to all faculty members. The Panel appreciates the faculty commitment and determination in ensuring the highest standards in QA practices.
- The Panel acknowledges through evidence provided and interviews with faculty, SAC and PAC members that stakeholder's feedback is effectively used to implement QA

progressive change to attain the highest standards of academic practice despite budgetary limitations.

#### **Indicator 4.2: Programme Management and Leadership**

*The programme is managed in a way that demonstrates effective and responsible leadership and there are clear lines of accountability.*

##### **Judgement: Addressed**

- The CHENG programme QA is managed by a well-structured organisational hierarchy which provides efficient communication and decision support. The programme is housed in the Department of Chemical Engineering. The Department Council, which is chaired by the HoD, receives decision support from 16 departmental committees, and oversees matters related to teaching, research, and examination, as well as scientific, cultural and sports affairs within the Department. At the college level, the College Council sets the strategic directions of the programme, provides the necessary support, and monitors its progression.
- The department committees are established at the beginning of each academic year with clear terms of reference. Committee chairs report to the HoD and to the Department Council, as shown in the minutes of meetings, to further discuss and approve academic decisions. The HoD reports to the Dean. The Panel confirms that the existing reporting lines are clear and effective.
- The key academic posts related to QA of academic programmes are the Vice President for Academic Programmes and Graduate studies, President Advisor for Academic Quality, College Deans, HoDs, Programme Coordinators, and the Faculty Members. Their duties and responsibilities are outlined in the Quality Manual. Similarly, the department committees' terms of reference provide the description, membership, roles, and responsibilities of these committees.
- The Department Council is responsible for approving all academic decisions made by the department's Academic Committee, including curriculum changes and introduction of new tracks and programmes. Then, the decisions are raised to the College Council, then forwarded to the Academic Committee at the university level and then to the University Council. The Panel is satisfied with the different levels of academic responsibility and the custodianship of the academic standards of the programme. Based on the evidence provided and interviews, the Panel concludes that the current management structure of the programme is effective with a strong organisational leadership.

### **Indicator 4.3: Annual and Periodic Review of the Programme**

*There are arrangements for annual internal evaluation and periodic reviews of the programme that incorporate both internal and external feedback and mechanisms are in place to implement recommendations for improvement.*

#### **Judgement: Addressed**

- As per the SER, the CHENG programme undergoes a thorough annual and periodic evaluation processes, in accordance with the Quality Assurance and Enhancement Policy, the Quality Manual, and the Operational Plan. The annual evaluation process includes inputs from different sources (i.e., admissions, assessment of PILOs, surveys, etc.), and results in an Annual SER, which is approved and endorsed by the Department Council. The Annual SER includes recommendations and improvement plan with clear allocated responsibilities and timeline. The Panel appreciates the sound process for the annual evaluation of the programme.
- As per the SER, periodic review has been conducted in 2008, 2014 and 2020 to ensure that the programme meets ABET accreditation requirements, in addition to a periodic review in 2019 to place the programme on the NQF. Furthermore, the SER, clarifies that the study plan was recently reviewed based on the benchmarking study conducted by the Department, the annual self-evaluation of the programme and the feedback received from the PAC and the SAC. The Panel learnt during interviews that as a result of the periodic review, a recent curriculum change plan was discussed and approved by all stakeholders and is currently undergoing implementation, where two new tracks are introduced (Process Systems and Oil & Gas). These amendments were commended by SAC and PAC members during the interviews. The QAAC, College Council, QAC, and the Department Council are responsible for monitoring the implementation of the periodic review recommendations.

### **Indicator 4.4: Benchmarking and Surveys**

*Benchmarking studies and the structured comments collected from stakeholders' surveys are analysed and the outcomes are used to inform decisions on programmes and are made available to the stakeholders.*

#### **Judgement: Addressed**

- UoB has a Benchmarking Policy, which ensures comparability of its programmes with similar local, regional, and international programmes. A benchmarking study was recently conducted for the CHENG programme in 2021-2022 with two regional programmes and seven international programmes, where the level of similarities varied

between 80% to 91%. The overall results of the benchmarking report have been considered for improving the programme by the departments' Academic Committee. The Panel concludes that the benchmarking study has been effectively utilised to improve the programme.

- The Department conducts regular meetings with PAC and SAC and uses several periodic surveys to collect the feedback of internal and external stakeholders. During the interviews, the Panel was able to confirm the existence of a strong cooperation between the Department and its stakeholders (including SAC and PAC). Evidence was provided to demonstrate that feedback and recommendations made by stakeholders are acted upon. For example, a recent curriculum change plan is discussed and approved by all stakeholders and is currently under action by the Academic Committee as shown in the minutes of meetings documents. Evidence was also provided on annual feedback and recommendations on issues related to student advising, faculty load and curriculum changes to meet market and industry needs.

#### **Indicator 4.5: Relevance to Labour market and Societal Needs**

*The programme has a functioning advisory board and there is continuous scoping of the labour market and the national and societal needs, where appropriate for the programme type, to ensure the relevancy and currency of the programme.*

#### **Judgement: Addressed**

- The CHENG programme has a functioning PAC with clear roles and responsibilities that are defined in its terms of reference. The PAC includes industry representatives, employers, and alumni. As per the SER, the PAC meets at least once a year. As mentioned earlier in this Report, the feedback and suggestions of the PAC members are compiled and reported in the Annual SERs and action plans are set based on their feedback and suggestions with clear responsibilities and timeframe. The PAC members confirmed to the Panel during the interviews that results from the QAC and Annual SERs are discussed and shared with all stakeholders and commended the recent curriculum changes and the two new tracks in the CHENG programme.
- Based on the evidence provided and interviews, the Panel learned that the Department relies on feedback from both the PAC and SAC and the different survey analysis to ensure that the programme is aligned with the labour market needs and stays up to date with the changes in the Chemical Engineering profession. The Panel confirms that the Department has a very strong relationship with the industrial sector in Bahrain and relies on the continuous feedback from the labour market to shape and introduce necessary improvements to the programme. However, the Panel recommends that the College should conduct more detailed market analysis on a regular basis using other tools in

addition to surveys such as interviews and published statistics to ensure that the CHENG programme meets the labour market needs.

## V. Conclusion

Taking into account the institution's own self-evaluation report, the evidence gathered from the interviews and documentation made available during the virtual site visit, the Panel draws the following conclusion in accordance with the DHR/BQA *Academic Programme Reviews (Cycle 2) Handbook, 2020*:

**There is Confidence in the B.Sc. in Chemical Engineering of College of Engineering offered by the University of Bahrain.**

**In coming to its conclusion regarding the four Standards, the Panel notes, with appreciation, the following:**

1. The variety of life-long learning activities provided to students.
2. The Engineering Library is well-equipped with e-books and electronic journals which support the teaching, learning and research needs of the faculty and students.
3. The interaction between faculty, alumni, and local industry, which leads to students' employment after their graduation.
4. The faculty commitment and determination in ensuring the highest standards in quality assurance practices.
5. The sound process for the annual evaluation of the programme.

**In terms of improvement, the Panel recommends that the University of Bahrain should:**

1. Introduce a risk register, which includes the risks related to the quality of the programme, its delivery and academic standards, and ensure that such a register is regularly updated, and the identified risks are effectively dealt with.
2. Develop separate PILOs for each track (Process Systems, and Oil and Gas), taking into consideration the differences between these tracks.
3. Include more biological training for students, particularly in the areas of biological reactor design, wastewater treatment, and/or fermented food manufacturing.
4. Add the 'Process Safety' (CHENG465) course to the compulsory courses and ensure that all students are introduced to safety engineering, including Hazard and Operability Analysis (HAZOP).
5. Review the delivery of English communication skills of students, and their leadership and managerial skills throughout the programme with the aim of improving these soft

skills, in addition to increasing students' access to practical sessions to further enhance their practical skills.

6. Review the course syllabi and update the textbook and reference sections with recent book editions.
7. Develop a research plan that is aligned with the college strategic goals, mission, and vision; devise a clear procedure to ensure that quality scientific research is carried out by faculty members; and set a plan to encourage faculty to apply for promotion.
8. Urgently expedite the implementation of the Departments' plan to recruit faculty members at the Department of Chemical Engineering.
9. Monitor the staff turnover and ensure the retention of highly qualified academic staff members.
10. Develop and expedite the implementation of a plan for the acquisition of sufficient modernized equipment.
11. Expedite the implementation of a plan for addressing building maintenance, particularly of the Air Condition system, and provide more suitable toilets for the special needs.
12. Ensure that generated reports of the utilization of laboratories, e-learning and e-resources are used to inform decision making.
13. Urgently develop and implement a plan to recruit more laboratory technicians and staff to assist with the administrative work at the Department.
14. Revise the policies and regulations related to external moderation to include clear criteria for the appointment and approval of external moderators.
15. Ensure that internal and external moderations are done for all course assessments and encourage both the internal and external moderators to add their written feedback on the moderation forms.
16. Review the two courses of the capstone projects with the aim of merging them to produce a formal design project course that covers technical, economic, and environmental requirements in-line with international standards.
17. Ensure that the work required from students in the capstone projects is reviewed and coordinated to ensure that Student Outcomes (SO2 'an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors' and SO4 'an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must

consider the impact of engineering solutions in global, economic, environmental, and societal contexts') are being emphasised.

18. Monitor the student failure rate and the number of students withdraw or exit with the new Diploma qualification with the aim to understand the root cause of the lower student outcome.
19. Conduct more detailed market analysis on a regular basis using other tools in addition to surveys such as interviews and published statistics to ensure that the programme meets the labour market needs.