ASIIN Seal

Accreditation Report

Bachelor's Degree Program
Mathematics

Provided by
Sultan Qaboos University

Version: 24 September 2024

Table of Content

A About the Accreditation Process

Name of the degree programme (in original language)	(Official) English translation of the name	Labels applied for [1]	Previous accreditation (issuing agency, validity)	Involved Technical Committees (TC)[2]
Mathematics	Mathematics	ASIIN	ASIIN 07.12.2018 – 30.09.2024	12
Date of the contract: 30.08.2022 **Submission of the final version of the self-assessment report:** 10.02.2024 **Date of the onsite visit:** 30.04.2024-01.05.2024 **at:** Campus Sultan Qaboos University main campus				
Expert panel: Prof. Rüdiger Kiesel, University Duisburg – Essen Prof. Khedr M. Abohassan, Dhofar University Dr. Erhard Quebe-Fehling, Novartis Pharma AG Ayat Hamed Mohammed Al Saidi, student from A'Sharqiyah University				
Representatives of the ASIIN headquarter: Dr. Andrea Kern				
Responsible decision-making committee: Accreditation Commission for Degree Programmes				
Criteria used: European Standards and Guidelines as of May 15, 2015 ASIIN General Criteria, as of December 10, 2015				

[1] ASIIN Seal for degree programs
[2] TC: Technical Committee for the following subject areas: TC 12 - Mathematics.

Subject-Specific Criteria of Technical Committee 12 – Mathematics as of December 9, 2016	

B Characteristics of the Degree Programme

a) Name	Final degree (original/English translation)	b) Areas of Specialization	c) Corresponding level of the EQF[3]	d) Mode of Study	e) Double/Joint Degree	f) Duration	g) Credit points/unit	h) Intake rhythm & First time of offer
Mathematics	B.Sc.		6	Full time	-	8 Semester	122 Omani credits / 244 ECTS credits ECTS	twice a year (January and August) & 1986

The Sultan Qaboos University (SQU) is one of two state universities in Oman. It was established in 1986 in al-Seeb (approximately 45 km from Muscat) and provides full scholarships to students for their higher education. SQU's strategic plans lists as their mission "to excel in teaching and learning, research and innovation and community service by promoting the principles of scientific analysis and creative thinking and to participate in the production, development and dissemination of knowledge and interact with national and international communities."

SQU promotes campus-wide projects to improve its study programs and research agendas. One of these main projects aims to implement active learning. Moreover, all study programs integrate new developments and advanced technologies. Both initiatives aim to prepare students for the job market of the future. In addition, SQU promotes applied, interdisciplinary and multidisciplinary research projects, focusing on cooperation and partnership projects with international higher education institutions and the local industry.

SQU is divided into the following nine colleges (1) Agriculture and Marine Sciences, (2) Art and Social Sciences, (3) Economics and Political Science, (4) Education, (5) Engineering, (6) Law, (7) Nursing, (8) Medicine and Health Science and (9) Science.

The bachelor program *Mathematics* is managed by the Department of Mathematics, which is one of the seven departments at the College of Science (COS). It offers the bachelor program in *Mathematics*, as well as two master programs (Mathematics and Applied Mathematics) and one doctoral program in Mathematics. In addition, the department collaborates with the College of Education in the interdisciplinary programs Mathematics Educa-

[3] EQF = The European Qualifications Framework for lifelong learning

tion and Primary Education. According to the representatives of the rector's office, the Department of Mathematics is considered as foundation to all departments in all colleges and it is a key pillar for the education programs.

The Department of Mathematics has defined the following key objectives as its vision and mission on their webpage [accessed on 28.05.2024]:

"The Vision of the Department of Mathematics is to become a leading center of excellence in teaching, research and community service.

The Mission of the Department of Mathematics is to:

a) "offer high quality applied and pure mathematics courses to our undergraduate as well as postgraduate students including many service courses to groups of students from other colleges at Sultan Qaboos University
b) equip our graduate students with the necessary skills and knowledge to pursue research in mathematics at the highest international standards.
c) offer a wide range of expertise of our staff in the service of Oman."

SQU describes the bachelor program Mathematics as follows on its webpage [accessed on 28.05.2024]:

"Pure mathematics is essential for many other scientific disciplines. Applied and numerical mathematics studies life issues and proposed solutions that can be applied in practice."

C Expert Report for the ASIIN Seal

1. The Degree Programme: Concept, Content & Implementation

Criterion 1.1 Objectives and Learning Outcomes of a Degree Programme (Intended Qualifications Profile)

Evidence:

- Self-assessment report
- Webpage https://www.squ.edu.om/
- Webpage Department of Mathematics https://www.squ.edu.om/science/Departments/Mathematics
- Webpage Ba Mathematics https://www.squ.edu.om/science/Departments/Mathematics/BSc-in-Mathematics
- Diploma Supplement
- Data on student employment
- Discussion during the audit

Preliminary assessment and analysis of the experts:
SQU describes in its self-assessment report that the bachelor program *Mathematics* was established in 1986 followed by a continuous improvement. According to the diploma supplement, the study program has the following objectives and learning outcomes:

"The Mathematics Bachelor program aims to:

a) provide graduates with a coherent knowledge of mathematics, both in breadth and depth, on the principles and practice of the subjects
b) produce graduates who can apply their mathematical knowledge effectively in interdisciplinary areas
c) produce graduates with good communication skills
d) produce graduates who can apply their acquired knowledge and skills in mathematics to solving real life problems
e) produce graduates prepared for life-long learning and subsequent graduate studies
f) produce graduates who can think analytically and critically

The Mathematics Bachelor program has outcomes that leads to produce graduates who can:

1) apply the knowledge and skills acquired in mathematics in solving real life problems
2) identify, formulate, and solve mathematical problems
3) communicate effectively with a range of different audiences
4) write reports clearly and legibly and systematically
5) function effectively as a team player to accomplish a common goal
6) recognise the need for self-improvement and seek more knowledge and skills in mathematics
7) reach out and cope with complexities of interdisciplinary applications
8) understand the professional responsibilities
9) think analytically and critically, and to engage in innovative applications of mathematics in diverse areas."

SQU further presents an overview of the types of occupations graduates work in. According to the data provided the experts notice that most of the graduates are either working in education or science (ministries, research institutes, etc.); however, the program coordinators admit that the university encounter challenges in tracing its alumni.

The experts are interested in the philosophy behind the bachelor program and which kind of students SQU targets. The program coordinators explain that they want to create a strong foundation in mathematics for students to allow them to develop further in future jobs and/or research. They state that they want to create a program on a high standard, which is one reason to value the international accreditation. The representatives of the rector's office describe that the strategic plan for the bachelor program *Mathematics* aims to reshape the program to produce graduates ready to find a career in industry. According to SQU's analysis, there is a new job market for mathematics, especially applied mathematics. The program coordinators add that their graduates are already well received on the job market; however, they want to ensure that the students continue to have suitable skills on international standards. Therefore, they appreciate the accreditation as a support to continue to improve their study program. In addition, SQU has recently formed an Advisory Board, which shall facilitate the connection to the industry and provide support to integrate industry applications to the study program in the future. One additional duty of the Advisory Board is to provide input for the development of the program learning outcomes of the bachelor program *Mathematics*. The experts approve these developments and welcome the formation of an Advisory Board. They add that they recommend that the Advisory Board should become active in the near future to support the development of the bachelor program in Mathematics.

The program coordinators explain to the experts that they are going to increase the interdisciplinary aspect of their program by introducing shared electives with various departments within the COS. Examples are a course on “Computational Hydrogeology”, “Cryptography” or “Computational and Industrial Mathematics.” These courses will be taught jointly with lectures from the different departments. The experts welcome the interdisciplinary efforts with other department within COS and outside COS.

In addition, the departments develop new minors, such as a minor on data science, biomathematics and nanotechnology. Further, they plan to deepen the collaboration between the departments of Mathematics, Statistics and Computer Science to promote SQU’s campus-wide project on integrating artificial intelligence and machine learning into their study program. The university representatives state that the university has made several purchases, which can be integrated including a virtual reality lab. SQU further hosts a high-performance computer, which can be used free of charge for projects involving complex models. The experts strongly approve a stronger collaboration between the departments. In their opinion, SQU should intensify the interdisciplinary collaboration between the departments, which will have a positive impact on teaching and research.

The students and alumni inform the expert panel that they choose SQU due its high reputation, particularly for study programs in science. They consider that an education at SQU provides them with many opportunities for their career and further education. They appreciate especially the organization of a major and an additional minor, which broadens their field of expertise. In addition, they state that their expectations were met.

In conclusion, the expert panel confirms that SQU has defined clear objectives and learning outcomes for the bachelor program mathematics. They are transparently anchored and published on the university webpage [accessed on 17.06.2024] and thus are available to students, lecturers and interested third parties. In the opinion of the experts, these objectives and learning outcomes reflect the targeted academic qualification level, are feasible and equivalent to the relevant exemplary learning outcomes specified in the applicable SSC (academic classification). Furthermore, they are aligned with the professional activity corresponding to the European Qualifications Framework level 6.

The experts observe that SQU consider the demand of the job market in their development of the study program during regular reviews. Although the expert panel acknowledges the newly established Advisory Board, it considers that SQU needs to ensure that stakeholders are actively involved in the development of the study programs. According to the expert panel, SQU should form a group/committee, where various stakeholders are able to give feedback to their different needs. This group should contain students, alumni, representatives from the university management and lecturers as well as industry representatives.

Criterion 1.2 Name of the Degree Programme

Evidence:

- Graduate certificate
- Webpage https://www.squ.edu.om/
- Webpage Department of Mathematics https://www.squ.edu.om/science/Departments/Mathematics
- Webpage Ba Mathematics https://www.squ.edu.om/science/Departments/Mathematics/BSc-in-Mathematics
- Diploma Supplement

Preliminary assessment and analysis of the experts:
The experts acknowledge the name of the study program; they consider that the title of the bachelor program Mathematics reflects the intended objectives and learning outcomes. They confirm that these are in agreement with the teaching and learning content. According to all presented documents and the online representation of the study program, the expert panel ensure that the name of the study program is used consistently.

Criterion 1.3 Curriculum

Evidence:

- Self-assessment report
- Degree and study plan
- Module handbook
- Objective-module matrix
- Student handbook
- Information set on the „Eidaad interns pack“
- Undergraduate Academic Regulations
- Undergraduate Academic Assessment Policy
- SQU information on exchange programs https://www.squ.edu.om/Academics/Student-Exchange-Program
- Student Exchange Regulations
- Discussion during the audit

Preliminary assessment and analysis of the experts:
After reviewing the documents and discussing the content during the on-site visit, the experts learn that students need to complete a non-credited foundation program to confirm their knowledge on basic subjects before they enter a college (see criterion 1.4). After the admission to a college, students complete their pre-major. During this status, students are not assigned with any study program yet, but complete courses required by the university as well as the college. These include for example in the first semester one course in "Arabic" (university requirement) as well as one course on "Communication in Science" (COS requirement). In addition, students need to select specific courses, which determine the major program they are allowed to enter. Once students are accepted in the major *Mathematics*, they have to complete the compulsory courses of the bachelor program. Students continue to choose electives in their major, on college level and on university level. SQU requires eight semesters to complete the pre-major and major studies. The experts confirm that regulations are published in the student handbook on "Undergraduate Academic Regulations."

SQU presents the following overview of the study program Mathematics in the degree and study plan:

Summary of Credits:		
University Requirements (UR)		**6**
Foundation Program	NC+	
Arabic	2	
Oman: State and People	2	
Oman & Islamic Civilization or Islamic Culture	2	
University Electives (UE) See SQU Deanship of A&R website		**6**
College Requirements (CR) See list B		**3**
College Electives (CE) See list C		**16**
Departmental Requirements (DR) See list D		**19**
Departmental Electives (DE) See list E		**12**
Major Requirements (AR) See list F		**35**
Major Electives (AE) See list G		**25**
Specialization Requirements (SR) See list H		
Specialization Electives (SE) See list I		
Minor Requirements (IR) See list J		**++**
Minor Electives (IE) See list K		**++**
TOTAL		**122**

+ Not credited.

++ Minor is optional: Total credits to earn a minor are 18. No more than 8 credits counting towards the major degree may count towards a minor.

Figure 1. Overview of the credit point distribution of the bachelor program Mathematics *- note 122 Omani credit points represent 244 European Credit Transfer and Accumulation System credit points; see more details in criterion 1.5 on work-load (source. Degree and Study plan).*

The program coordinators describe to the experts how the study program was improved since the last accreditation in 2018. They adapted the suggestion from the previous expert panel to split the courses in fundamental mathematics between the bachelor students of *Mathematics* and the various engineering disciplines, such as “Linear Algebra” (MATH2202) or “Calculus 2” (MATH2108). In addition, they increased the number of credit points for the module “Foundations in Mathematics” in the second semester. Overall, the content of their lectures was revised in order to strengthen the basics and fundamentals in mathematics.

Students are confronted with developing their skills for proof and reasoning in e.g. “Calculus 2.” Similarly, in “Linear Algebra” students are assigned independent work, including poster presentations or oral presentations. Within a campus-wide project to introduce new technologies to students, the program coordinators have further reviewed the use of software in their courses. This led to an increased use of MATLAB and Maple in the majority of courses. Exercises requiring software are often integrated as homework or assignments. The program coordinators explain that students are introduced to the software at the beginning of their studies and improve their skills throughout the next semesters. The program coordinators add that SQU offers licenses for students to allow them to practice on their laptops. In addition, these software programs are installed on the computers in the computer laboratories. The program coordinators confirm that students mainly use Maple, which they consider as an easy software to apply. Whenever they need to use a new software or tool, they receive an introduction. Most of the exercises are done in groups. Therefore, they are very satisfied with the implementation of software in their program. The experts continue to ask them about programming languages. The program coordinators and students confirm that there is one course on Python during their pre-major and that they continue to code during their major studies.

Furthermore, the program coordinators explain that they also implement the campus-wide SQU initiative for active learning in their courses. A stronger focus on student-centered learning satisfies also the demands of the students in their last end-semester evaluations and student satisfaction surveys and is appreciated by the experts likewise.

The experts continue to compare the theoretical and applied content of the modules; in their opinion, the study program is still dominated by theoretical mathematics. However, the program coordinators highlight that there are several applied courses in the program. Most applied courses are elective courses, which cover various fields. The experts specify that the curriculum misses content on optimization, stochastics and probability. The program coordinators describe that there is an elective course “Introduction to Optimization” (MATH4481) as well as courses in the first and second semester on “Introduction to Probability” (STAT2102) and “Introduction to Statistics” (STAT2101). The experts understand from the program coordinators explanation that students have opportunities to participate in courses outside their major study program including during the pre-major. The experts continue to emphasize on the importance of applied content in the curriculum of the bachelor *Mathematics*. In their opinion, this goes beyond modules and needs to be addressed in the classroom. However, according to the submitted module descriptions and the referenced literature, the experts recommend extending the content of applied mathematics in the study plan. This should include contemporary and applied examples such as real-world

data or data from industry. Moreover, the content of applied and modern reading materials needs to be updated in the modules and should be reflected in the module descriptions.

To foster the independent work of students, the study program coordinators extended the final project to two modules in the seventh (two credits) and eighth semesters (four credits). They mention that the course teaching methods were adapted accordingly to focus more on research-based learning. The experts question the learning outcomes of the final thesis, which states the ability of students "to communicate to different audiences." Although the experts acknowledge that students have to give an oral (poster) presentation, they consider this as only one type of audience. The program coordinators suggest that they also plan to invite participants from the industry in the future to widen the audience, which the experts would appreciate. However, considering the importance of communication skills for students, the experts add that sufficient training in this topic would benefit the students. Further discussion regarding the final thesis is summarized in criterion 2.

The experts further learn that the current curriculum of the bachelor program ***Mathematics*** does not contain any compulsory internship. The program coordinators explain that students can take part in an optional internship, which allows them to spend one year in industry. It is a national program called Eidaad, which is centrally managed at the Ministry of Higher Education, Research and Innovation and the Petroleum Development Oman. The university has no influence to suggest companies or industry partners. According to program coordinators, no student has yet taken part in the internship. Nevertheless, two have applied and are waiting for decisions and placement. In addition, the program coordinators present module description for a two-semester internship (module MATH5401 and MATH5402). The experts remain uncertain if the description of these two modules refers to the Eidaad program and/or whether an internship could be managed independently. The modules are classified as major electives for a two-semester industrial internship. In the experts' opinion, the objective and learning outcomes of the modules are clearly defined; nevertheless, the experts are uncertain to which degree the university can observe the achievement of the learning outcomes if the entire organization is done by a third party. Considering the discussion during the on-site visit, the experts highlight that SQU should reconsider the learning outcomes of these two modules and present transparently if these modules are independent of the Eidaad program. The program coordinators remark that there is no culture for industry internships for mathematics programs in Oman; therefore, it is a challenge to find suitable partners. The students confirm to the experts that the internship within the Eidaad program is optional. None has taken part in any internship yet, but one student present in the discussion has applied and is currently waiting for the decision from the government. As one major motivation, they mention the improvement of communication skills and their plan to pursue a career in industry. The students state that

they could not select a type of company during the application, which raises some concern with the experts about the suitability of the internship for students to improve their skills in mathematics.

The students describe to the experts that they plan their studies after consulting with their advisor. The advisors support them in selecting courses and balancing their workload. They state that they welcome this advice; nevertheless, they are free to proceed if they disagree. Thus, some students also prefer to read the course content online and proceed with different courses based on the information SQU provides online. The students add that course material is shared on the Moodle platform. Whereas some instructors prefer to upload the course materials weekly, others provide the entire content at the beginning of the course.

Overall, the expert consider that the presented curriculum enables students to achieve the intended learning outcomes. They observe that SQU has defined learning outcomes for each module, which, in total, support the students to achieve the overarching program objectives. Each module represents a well-matched unit of teaching and learning. The expert panel considers that the order of the modules is adequate and that the students can complete it within the standard period of study.

In the opinion of the experts, the study program would benefit from the implementation of an optional internship, which would allow the students to gain practical experience in off-campus activities without prolonging their studies. It is appreciated that the Eidaad program allows students to spend one full-year in the industry; however, the experts are concerned that the university has neither influence on the placement of the students nor the content of the internship. In addition, the experts highlight that taking part in the Eidaad program puts the studies on hold, which results in a total study duration of at least 12 semesters until graduation. Thus, the experts emphasize that SQU should develop an internship module, where students spend three to six months in a company or institution, where SQU ensures that the content matches the study program. In addition, the university needs to coordinate the content with the participating companies and it should maintain supervision of the students during the internship.

Student mobility

The program coordinators describe to the expert that SQU has several agreements in place supporting student mobility. Collaboration agreements with these universities regulate the externally achieved credit points. The entire process is managed by the International Office at SQU, who supports students in finding suitable universities for their exchange. The experts observe that information on exchange programs and regulations is posted in SQU's

webpage. However so far, very few students of the bachelor program *Mathematics* have made use of this program. The students confirm to be aware of the possibility to participate in student exchange programs. They explain that the university usually shares this information via email inviting all interested students to join a seminar. However, the students consider that their program at SQU is built up from the basics; therefore, they are concerned that the content of their studies might not align with other (international) programs or courses. Consequently, they do not want to risk repeating one semester. Overall, they enjoy studying at SQU and they are satisfied with their education. According to them, there is no student mobility in the bachelor program *Mathematics*.

The expert summarize that SQU offers opportunities for students to participate in international student mobility through an appropriate framework (structural design of the degree program, recognition of qualifications and support services). However, the experts note that the students are not encouraged to spend time outside SQU. In addition, there might be some misconception about the recognition of awarded credit points from other institutions. The experts comment that students should be made aware of the benefits for spending time at other universities and gaining experience abroad during their studies.

Periodic review of the curriculum:

The program coordinators explain that the quality management unit at the department level is responsible for monitoring and improving the learning outcomes of each module. Changes in the learning outcomes usually occur either based on request from the university management or from within the department. University-wide projects and changes in SQU's strategic plan usually result in modifications of the program learning outcomes. Lecturers usually draft updates due to content change meeting with students or industry demands and new developments in their field. SQU describes in its self-assessment report that various stakeholders are involved in the regular updates from the study program. Since the study program has received ASIIN accreditation, the suggestions were implemented. An upcoming curriculum review will take place after this accreditation process.

Thus, the experts confirm that the curriculum is periodically reviewed following the duration of the accreditation in regard to major revisions. The experts have received evidences that these changes are documented and all involved stakeholders are informed accordingly.

Criterion 1.4 Admission Requirements

Evidence:

- Self-assessment report
- Undergraduate Academic Regulations
- SQU webpage https://www.squ.edu.om/
- SQU admission webpage https://www.squ.edu.om/admissions
- Ba Mathematics webpage https://www.squ.edu.om/science/Departments/Mathematics/BSc-in-Mathematics
- Discussion during the audit

Preliminary assessment and analysis of the experts:
According to the self-assessment report, the admission to SQU is centrally managed by the Ministry of Higher Education, Research and Innovation. Applicants are required to have successfully passed the Omani school-leaving certificate or equivalent certificate/diploma from other recognized institutions. The admission is strictly based on merit. Admission is regulated online via the university webpage.

In the discussion, the program coordinators describe that the admission to the study program is managed by the COS. They explain to the experts that students entering SQU have to complete a foundation program first, which is administered by the Centre for Preparatory Studies at SQU. To test their qualification, students undergo an entrance test, which places them on a level according to their skills. Qualified students, who reach high scores in the initial test, are able to skip the foundation program completely. Each semester ends with an exam as an evaluation whether all qualifications for studying at SQU are reached ("exit exam"). Usually, students spend between one and three semesters in the foundation program. The students highlight that they considered the foundation program as very useful for them. They have studied at school only in Arabic, while all programs at SQU are fully managed in English. Thus, this foundation program allows them to adjust to English learning in subject specific classes. In addition, they are getting used to the environment and have time to find and select their study interests.

The experts learn that after completing the foundation program, the students choose a college, where they enter the pre-major phase. In this phase, students need to complete certain basic introduction courses. Moreover, students need to complete the pre-requirements to enter their study program. To select the major *Mathematics*, students are required to have completed the course "Calculus 1" (MATH2107) with at least the grade C,

plus two additional from COS. Their GPA is required to be higher than 2.00 before entering their major in M*athematics.* Only after the students have successfully applied for their major, they officially enter the Department of Mathematics. The experts confirm that the admission criteria to the major Mathematics are available online while general information on admission is summarized in the Undergraduate Academic Regulations and on the SQU webpage.

The representatives of the rector's office describe to the experts that the admission to each college follows a quota, which is determined by SQU. In turn, each college determines a quota for each of its study programs. The entrance criteria quota for each study program are evaluated annually. They add that since they are a governmental university, where students can study without paying tuition fees, their quotas are usually full. The acceptance quota for the bachelor program of *Mathematics* is currently set to 45–50 students. If the numbers of applications were to increase, the Head of the Department can request an increase of the quota. Each request is evaluated carefully to ensure that the department can adequately accommodate the higher number of students in terms of lecturers, space and equipment. If sufficient resources are available, an increase of the quota is granted. The students add that they consider themselves well informed about the processes to switch from the foundation year to the pre-major and then their major. SQU usually informs them via email once they qualified for the next step and their responsibilities. They admit that there are many students, who are unsuccessful in getting into their favorite major in their first try. Most of them continue to try at least a second time.

The experts further ask for regulations regarding transfer students. The representatives of the rector's office highlight that such regulations are in place and published on their webpage and integrated in the Undergraduate Academic Regulations handbook. The representatives of the rector's office comment that each college has different transfer requirements. A transfer is only possible if the desired study program also has vacancies to ensure the quality of teaching. They add that transfer students within SQU are very common.

Upon the question of the experts, the representatives of the rector's office state that there are at the present time no international students at SQU. However, SQU is currently working on a program to allow 10% of international students to each study program. International students would have to pay tuition fees to cover their education.

After reviewing the documentation and the informative discussions during the on-site visit, the experts form the opinion that SQU has defined admission requirements and procedures, which are binding and transparent. SQU has issued rules for the recognition of qualifications achieved externally (e.g. at other higher education institutions or outside the higher education sector). The experts observe that clear regulations are in place for transfer

students and students visiting SQU. In addition, the experts learn that regular reviews on the admission requirements for the study program majors are in place.

Criterion 1.5 Workload and Credits

Evidence:

- Self-assessment report
- Module handbook
- Undergraduate Academic Regulations
- Degree and Study Plan
- Omani Qualification Framework
- Discussion during the audit

Preliminary assessment and analysis of the experts:
Based on the Degree and Study plan of the bachelor program *Mathematics* as well as the self-assessment report, the experts observe that SQU has implemented a credit point system based on the students' workload. The module handbook gives a clear definition of the workload in credits and working hours for each module, dividing further into contact hours and self-study hours. In the discussion, the program coordinators add that one Omani credit point currently represents four contact hours per week.

Nevertheless, after reading the documentation in the self-assessment report, the calculation of the student workload remains unclear to the experts, especially the conversion of Omani credit points to the European Credit Transfer and Accumulation System (ECTS) credit points. The program coordinators describe to the experts that the workload is defined at the time the course is created. They add that their time in the classroom always consists of lecture and tutorials. They give as one example, a course of three credit hours has four contact hours. This would represent two hours of lectures and two hours of tutorial. They specify that tutorials usually count as one credit point for a two hours tutorial. The lecturers are present during the tutorials while students have to work on exercises individually or in teams. Thus, the total number of credit points depends on the total workload of the students. However, the program coordinators specify that the current Omani credit point system does not consider the self-study hours; thus, the experts further question the conversion of Omani credit points to ECTS credit points.

The experts learn that SQU currently adapts all its lectures towards the new Omani Qualification Framework (OQF). Since the OQF follows a different definition of one credit point,

the program coordinators and the curriculum committee of the bachelor of *Mathematics* are reviewing the workload courses. Updates will also lead to an adaption towards the new Omani credit point system. The experts are informed that the new OQF was released in September 2023 and is defined as "the volume of learning estimated to be required by a typical learner at a specified level to achieve the Learning Outcomes of the units, modules or courses that comprise a qualification." Thus, it also considers the self-study of the students as well as their work spend on preparing for exams and completing homework/assignments. Within the OQF, the average students shall complete 120 OQM credit points or 30 OQF credit points per year. The experts note that this differs from the ECTS credit point definition. The program coordinators add that the transfer of their current curriculum to the new OQF regulations, which will take place in fall 2024, will result in a more comparable credit conversion. Since SQU is currently in the process of transferring their credit points, no conversion is presented during the on-site visit.

The students confirm to the experts during the on-site visit that they consider the total workload of their study program as adequate. They emphasize that students can select the number of courses for each semester. They admit that students might feel overwhelmed during the exam periods; however, they are able to manage their workload.

Based on the submitted documents, the experts observe that the minimum required workload per semester is nine credit points. Students on probation are not allowed to take more than 12 credit points per semester, while the average student takes around 15 credit points. Excellent students are allowed to take up to 18 credit points in one semester. These regulations are all based on the students' cumulative GPA. The program coordinators state that the average student, who takes between 12 and 15 credits each semester, is able to finish the bachelor program *Mathematics* within eight semesters. The experts confirm that these regulations are part of the student handbook on "Undergraduate Academic Regulations." The experts confirm that the definition of the workload of each semester based on the students' GPA is part of the student handbook; however, they miss a precise definition of a credit point in all documents. Although they appreciate the details given in the module handbook, they recommend SQU to also establish a standard definition of the students' workload of one credit point, which should be part of the student handbook to ensure they are aware of the definition.

The experts conclude that the credit point system implemented at SQU is oriented towards the students' workload. The experts consider that the estimated workload is realistic and well-founded, so that the study program can be completed in the standard period of study. Nevertheless, the experts would appreciate a more thorough documentation of the student total workload and a more detailed conversion scheme between the Omani credit point system and ECTS.

Criterion 1.6 Didactic and Teaching Methodology

Evidence:

- Self-assessment report
- Student handbook on „Undergraduate Academic Regulations“
- Module handbook
- Discussion during the audit

Preliminary assessment and analysis of the experts:
According to the self-assessment report, SQU applies a combination of conventional and e-learning methods to deliver course content. The effectiveness of the teaching methods is part of the end-semester evaluation conducted among all students of one course. The documentation describes that the study program *Mathematics* implements lectures, tutorials, and labs, particularly for courses involving computing elements. The program coordinators describe that the class sizes are kept small usually containing 30–35 students, which ensures a manageable student to lecturer ratio and effective learning.

The students explain to the experts that all theoretical classes in the bachelor program *Mathematics* are accompanied by tutorials. They explain that a three credit-point course contains two hours of lecture and two hours of tutorials. Thus, four contact hours plus self-studies. They greatly appreciate the tutorial as learning support. The experts approve the size of tutorials, although they question the workload calculation (see criterion 1.5).

The program coordinators inform the experts that SQU has a campus-wide project to implement active learning (or learner-centered teaching) in all courses if feasible. For the bachelor program of *Mathematics*, this process is just beginning. Recently, several colleagues from the department, who will now take a leading role for the implementation across the study program, attended a workshop on active learning. The program coordinators add that SQU provided this training at the SQU Center for Excellence in Teaching and Learning. The participants of the training consider it as very helpful for reflecting and improving their personal teaching skills.

The program coordinators describe that in the upcoming process to review the teaching methods, they aim to involve students actively in the lectures. Active learning has been used in some courses of the bachelor of Mathematics. They closely monitor the students' performance. While the lectures are still mainly organized in traditional frontal teaching, the accompanying tutorials mainly apply working in teams of four to five students. Each

team has an assigned leader, who distributes the problems among their teammates. Usually, each student has to solve around three problems individually; if question occur, they are discussed within the group before the lecturers can be consulted. The lecturers' observations of the last semester indicate that team formed with one member, who commonly receives high grades, increase the performance of all students in a team at the end of the semester.

The experts continue to ask which strategy SQU has in place to address the use of artificial intelligence in and outside the classroom. The experts learn that SQU is currently developing a relevant strategy. The representatives of the rector's office highlight that the working title is 3-P, which refer to the three steps of addressing artificial intelligence in their lectures: prohibition, permission and promotion. Guidelines are currently drafted as part of a comprehensive framework, including recommendations for lectures, homework/assignments as well as the final thesis. The program coordinators add that they have already developed some exercises, where students can use freely available artificial intelligence such as ChatGPT to solve problems. They aim to find ways to support the use of these new tools to enrich the lectures and the students' practical skills.

The students confirm to the experts that they receive the course materials prior to the classes using Moodle. They add that depending on the content, the lectures might contain exercises as homework. The students usually work on them individually or in teams before the results will be discussed during the next class. The students confirm that there are courses, where students have to present the results of group work in front of the class. In their opinion, they appreciate the active learning implemented in courses such as "Calculus 1".

Therefore, the experts conclude that SQU has integrated a variety of teaching methods and didactic means to promote achieving the learning outcomes. The experts appreciate student-centered learning and teaching methods in the bachelor program *Mathematics* and emphasize that SQU should continue to expand these methods in all modules if feasible.

Final assessment of the experts after the comment of the Higher Education Institution regarding criterion 1:

ad criterion 1.1

The experts review the SQU's statement and appreciate that the Advisory Board combines representatives of alumni, university management, lecturers, and industry representatives. The experts appreciate that SQU formed one committee with external and internal stakeholders; however, they highlight the importance of the Advisory Board to collect the opinion of external stakeholders, especially from the industry sector as future employers. To

ensure the involvement of external stakeholders from the private sector in the development from the study program, the experts continue to issue A1.

Furthermore, the experts decide on the recommendation E1 and E2. The experts suggest the Department of Mathematics to increase the collaboration with various departments at SQU in teaching and research. In addition, they emphasize the importance of the Advisory board to meet as soon as possible to discuss the bachelor program Mathematics. The experts comment, that their meetings need to be documented to develop actions based on their feedback.

Ad criterion 1.3.

The experts approve that SQU aims to strengthen the applied component of the bachelor program Mathematics. To support SQU in its development, the experts issue the recommendation E3. To support the practical skills of students, the experts further decide on the recommendation E4 to integrate the possibility for internships within the curriculum, which do not prolong the students' studies.

Ad criterion 1.5.

The experts welcome SQU's description of the conversion from Omani credit points to ECTS credit points. The experts are aware that SQU is currently transitioning to a new credit point system based on the latest Omani Qualification Framework. They acknowledge that this is a complex process; thus, they do not issue any recommendations or requirements in this regard. However, they would welcome to have a possibility to review the new workload calculations once the conversion is finished.

Ad 1.6.

Although the university management informed the experts during the on-site visit, that SQU aims to establish a strategy for the integration of artificial intelligence across the university, the experts state the importance to implement this strategy for the bachelor program of Mathematics. The Department of Mathematics should find its own tools and strategies for its study programs, which is expressed in the recommendation E5.

2. Exams: System, Concept and Organization

Criterion 2 Exams: System, Concept and Organization

Evidence:

- Self-assessment report
- Module handbook
- Undergraduate Academic Assessment Policy
- Undergraduate Academic Regulations
- Guidelines for the final year project (part 1 and 2)
- Example moderation of examination form
- Examples of exams presented during the on-site visit
- Examples of final theses presented during the on-site visit
- Discussion during the audit

Preliminary assessment and analysis of the experts:
The experts observe that the assessment criteria are described in detail in the module handbook as well as in the student handbook on "Undergraduate Academic Regulations." Based on this documentation, the experts learn that there are typically mid-term and final examinations, while continuous assessment takes place with quizzes and home assignments. The final examination usually weights between 40–60% of the final grade. A percentage of the weight is given in the module handbook. The experts observe that none of the module included in the module handbook includes projects or practical assessment components.

The program coordinators highlight that during the accreditation in 2018, students complained about the high number of assessments during the semester. Therefore, the departments reviewed the number of quizzes and assignments. In addition, they started to coordinate the assessment dates to avoid overlap. All assessment dates have to be submitted to the Time Table Committee, who prepares a schedule for all instructors at the department. Nevertheless, the students inform the experts that they usually have quizzes or assignments every week.

The experts question how the exam moderation is organized at SQU. According to the program coordinators, the exam moderation ensures that the assessment questions allow to measure to which degree the learning outcomes are fulfilled. In most cases, moderators are previous instructors of the course and therefore familiar with the subjects. SQU includes moderators for their mid-term and final exams. The process starts with sharing the

exam questions with the moderators, who can comment and ask questions. Afterwards, the instructors need to respond officially to the moderator's remarks. Since the entire process is documented in one single form, the responsible committee can transparently monitor the entire process. Final year projects are similarly moderated. The program coordinators specify that all current moderators are members of Department of *Mathematics*.

The program coordinators also discuss the process to appeal grades. Students have three levels to submit their appeal. First, the appeal is received by the instructor, who reviews the grading and responds to the students. If they are still not satisfied, the students can submit an appeal at college level. In this case, a committee is formed, who collects all learning and assessment materials and additional information on this case. Although members of the committee might be part of the same department, the involved lecturer is excluded. Comparable steps are also possible on university level, which represent the last appeal possibility. The experts confirm that all necessary information is included in the student handbook Undergraduate Academic Regulations.

The experts further review several examples of final year project reports and discuss this topic with several groups. The students explain to the experts that they selected the topic for their final year project together with their supervisor. Once they had stated their topics of interest, the supervisor provided them with a selection of appropriate topics. The students confirm that they are permitted to work in pairs on one final project; however, they need to work on sections by themselves and are required to write a report by themselves.

The experts further are informed that SQU has issued an Agreement on Academic Integrity. Each final project will be reviewed for plagiarism using Turnitin on their Moodle platform. They only allow less than 20% similarity; however, the final decision is up to judgement of the supervisor. The program coordinators admit that the similarity index for projects in Mathematics is usually high since all equations and calculations are often identified as plagiarism. In addition, homework and assignments are also examined using Turnitin. Similarly, the academic integrity at SQU prohibits cheating during examinations. If a student is caught cheating, the student needs to sign a form for confirmation before the case will be reviewed by a committee at SQU. The experts appreciate these regulations; however, they mention that none of the rules on Academic Integrity are included in the guidelines for the final projects. Likewise, no details are included in the Undergraduate Academic Regulations. The experts emphasize that topics of plagiarism and checks for originality should be integrated into these documents to provide a full presentation of regulations for the final year project as well as its grading.

During their review of the presented final year project, the experts notice that there is room for improvement regarding the quality of the students' work. This includes both length,

depth and detail of the presented works. In addition, the experts identify that the students use a low number of citations in their works with a strong focus on books and internet sources instead of scientific articles from peer-reviewed journals. In addition, the students lack knowledge on correct citation style. Overall, the experts comment that they would prefer if the structure of the final year report would follow scientific works (i.e. introduction, methods, results, discussion and conclusion). The representatives of the rector's office agree with the experts. They add that they had already identified the quality of the final year projects as one major issue for future improvement. The experts emphasize that SQU needs to put a stronger control on the submitted final year projects to ensure that the quality meets the requirements of a bachelor program. They add that a final year project which allows students to graduate from a bachelor program need to be equal to a bachelor thesis. The purpose of a bachelor's thesis is to give students an opportunity to independently work on a complex assignment, demonstrate their ability to formulate a thesis topic, select relevant literature, and process the data.

The experts summarize that SQU has implemented an assessment system, which allows for the assessment of the achievement of the learning objectives of the study program. They confirm that SQU has defined assessment methods for each module, which are published within the module handbook. The experts consider the assessment methods adequate to provide feedback to students on the competencies that they have acquired. Based on the evidences and the discussion during the audit, the experts summarize that students are informed about the conditions for completing the module (coursework, exams etc.) at the beginning of the module in addition to the module handbook. SQU has published transparent rules for make-up exams, non-attendance, cases of illness as well as compensation of disadvantages in the case of students with disabilities or special needs in its Undergraduate Academic Regulations, which are accessible to all students. The experts consider that the number and distribution of exams ensure an adequate workload and give sufficient time for preparation. Moreover, SQU has presented clear regulations for appealing against grades.

The experts acknowledge that SQU has implemented a final year project, which allows the students to graduate with a bachelor of science from the bachelor program *Mathematics*. Thus, the final year project should demonstrate that the students are able to work independently on a task at the intended level of EQF 6. Here, the experts identify room for improvement. The experts note that SQU needs to raise the scientific level of the final year project and ensure that students possess sufficient skills in scientific writing. This needs to encompass knowledge on the structure of a scientific work as well as correct regulations of citation. The experts additionally recommend that a higher number of students should

work on applied or real-world data in their final thesis, which potentially allows for collaborations with external partners such as industry or research institutions.

Final assessment of the experts after the comment of the Higher Education Institution regarding criterion 2:

According to SQU's statement, the bachelor program has two courses using a project as an assessment component (Final Year Project 1 & 2). The experts welcome this, but specify that it would be beneficial for students to work on several project prior to the final year projects. This should serve as a training for students to get familiar with scientific writing and provide new opportunities for students to demonstrate their skills. The experts appreciate SQU's strategy of continuous assessment and weekly quizzes. In their opinion, this might create a high workload for students; however, if this are clearly expressed in the module handbooks and the students are informed at the beginning of the course, the experts consider it acceptable.

Moreover, the experts appreciate that the two course Final Year Project 1 & 2 are now research-based courses. Nevertheless, the experts remain concerned of the scientific level of the final year projects. Thus, they issue the requirement A2, which asks SQU to submitted new final thesis for the fulfillment of requirements to demonstrate an improved quality of the final year project of the bachelor program *Mathematics*.

3. Resources

Criterion 3.1 Staff and Staff Development

Evidence:

- Self-assessment report
- Staff handbook
- Department of Mathematics webpage https://www.squ.edu.om/science/Departments/Mathematics/People
- College Annual Research Report 2022
- Example Actual Performance Evaluation (EJADA)
- Example students' end-semester evaluation
- Discussion during the audit

Preliminary assessment and analysis of the experts:
According to the self-assessment report, the Department of Mathematics is one of the largest departments at SQU with a total of 36 permanent staff members (status: fall 2023). Their faculty composition comprises six professors, eleven associate professors, 17 assistant professors, and one lecturer. The academic staff covers various fields of pure and applied mathematics, who engage in teaching, research and community service.

The program coordinators highlight that the members of the Department of Mathematics are also involved in service teaching at the Colleges of Science, Education, and Engineering. They add that their entire workload consists of 60% teaching, 30% research, and 10% administration (mainly within committees). After the experts inquire, the program coordinators admit that during some time of the semester, the administrative workload is higher. Nevertheless, overall, they do not consider it as a burden to conduct teaching and research.

The program coordinators further mention that the Department has two registered research groups at SQU; one on "Fractional Differential Equations: Application and Modeling" and one on "Modelling of Nanofluid Flows". During the last five years, the members of the department published on average one research articles per year. This qualitied those to win an SQU award as the most active research group. On average, this represents one article per faculty member per year. To support their research, they were able to acquire research projects from SQU as well as national and international grants (e.g. United Arab Emirates). The program coordinators add that internal grants at SQU are on competitive basis but relatively easy to acquire. The staff members can use them flexibly, for instance to covering travel activities or to purchase software. To foster their position as a research institution, the department further organized various workshops and conferences such as “Recent developments in Mathematics.” The program coordinators describe that SQU is actively supporting their research, such as incentives for scientific articles in journals listed as Q1. In addition, SQU covers fee for open access publications. As a result, international publications have a positive impact on promotion of academic staff. The experts welcome the positive trend concerning research output; however, they suggest putting a stronger focus on the journal quality to strengthen the research profile of SQU in mathematics in the international community.

According to the program coordinators, SQU has increased its focus for grant proposals in applied research providing solutions for problems of the community and industry. In addition, they plan to participate in an upcoming initiative of the Omani government creating a platform to connect industry and academia. However, this program has not started yet. They add that on college level, there are many collaborations with industry partners. Most of them consider various consultancy services with whom COS has contracts. A similar col-

laboration for the Department of Mathematics is planned, but preparations are still in progress. They are confident that the collaboration with their recently established Advisory Board will have a positive impact on their connection to industry. In their opinion, it is essential to introduce new industry partners to the applications of mathematics, which can support their development. As one obstacle, they consider that many companies in Oman are local representatives of global companies, which do their research outside of Oman.

According to the program coordinators, there are various opportunities for staff development within SQU's Center of Excellence for Teaching and Learning. When there are opportunities announced, there are always staff members volunteer to participate. The head of the department can further suggest individuals directly to attend a course/workshop when the topic appears useful to their courses. However, the program coordinators state that the participation on staff development is still on an individual basis.

In addition, the program coordinators explain SQU's regulation for promotion to the experts. SQU has recently switched to a new system to monitor the achievement of its academic staff. The system considers the teaching load, community service load as well as the research load. Achievements will be converted to points depending on the task, which qualifies them for promotion. The program coordinators mention that research contributes strongly to their promotion, but everyone has to fulfill all three criteria.

The program coordinators add that SQU allows visiting teachers. This includes mainly part-time teaching staff to support the permanent staff. The Time Table Committee identifies the need for additional instructors and announce it in the department. Visiting part-time lecturers are invited based on recommendations from the department. In most cases, visiting lecturers are previous lecturers at SQU or experts they have worked with. The Time Table Committee will review the person's CV before they officially invite this person to teach at SQU. The majority of visiting teachers have been invited several times, but their contracts are limited to one semester. Additionally, visiting lecturers are also evaluated to ensure the quality of teaching.

In conclusion, the expert panel considers the number, composition, professional orientation and qualification of the teaching staff are suitable for successfully delivering the bachelor program *Mathematics*. The experts approve the research conducted at the Department of Mathematics. Moreover, the experts acknowledge the staff development opportunities, including both the programs to improve the professional and didactic skills. Furthermore, the experts received confirmation that the number and qualifications of the academic staff is regularly reviewed to ensure an adequate student to staff ratio.

Criterion 3.2 Funds and equipment

Evidence:

- Self-assessment report
- Visitation of the campus facilities
- Discussion during the audit

Preliminary assessment and analysis of the experts:
SQU describes in their self-assessment report that as a state university, they receive their main funds from the state of Oman. The funds are officially transferred to the COS, which oversees the maintenance of the facilities. The funding is divided into several schemes of expenses. The representatives from the COS state that they are eager to support the request from the Department of Mathematics due to its support for other departments and colleagues. As a result, their requests are often answered positively.

During the visit of the campus, the experts observe that sufficient equipment at SQU is available concerning offices and classrooms. The experts learn that next to classrooms, computer laboratories are integrated in the teaching of the study program *Mathematics*. The experts confirm that the number of available computers matches the number of students in one class. However, the experts note that the available computers are several years old. The representatives of the rector's office mention that SQU has problems with purchasing equipment during the last two years mainly related due to difficulties in the distribution of its funds. Nevertheless, these problems are resolved now; thus, they have already received and bought new equipment for their computer laboratories. They acknowledge that the current equipment is between seven to eight years old exceeding the usual maximum age of five years. However, new computers are ordered and they should arrive soon at SQU.

The program coordinators add that they consider the amount of available equipment when planning courses. If the number of students is too large, they are going to split the group to match the facilities' limitations. However, in their experience, SQU provides sufficient facilities to support their teaching, especially regarding computer laboratories. In addition, COS offers two room designed for active learning, which they intend to integrate into their courses.

During the visitation of the campus, the experts view the classrooms, laboratories, the main SQU library as well as several students' independent learning centers. The department additionally offers a room, where final year students can work, meet and discuss. The experts appreciate the various facilities, which allow students to learn, study and do group work on campus.

Concerning literature, the experts learn that SQU provides hardcopy books for each course, which students can keep during the semester. COS receives a fixed budget for books. Every department can submit requests, which will be evaluated at a committee on college level. The program coordinators demonstrate to the experts that SQU has online access to the most common scientific publishers and thus can access the most recent literature in their field of research. They add that students can enter the online library with their student's account.

The experts form the opinion that the financial resources and the available equipment constitute are managed in a sustainable manner to support the teaching of the bachelor program *Mathematics*. The experts conclude that SQU supports the Department of Mathematics with secure funding and an adequate infrastructure in terms of both quantity and quality. The experts express the importance of keeping their facilities and available software up to date; nevertheless, they consider that SQU seriously acknowledges this demand and takes steps towards improvement.

Final assessment of the experts after the comment of the Higher Education Institution regarding criterion 3:

SQU does not comment on this criterion in its statement.

4. Transparency and Documentation

Criterion 4.1 Module Descriptions

Evidence:

- Self-assessment report
- Webpage Ba Mathematics https://www.squ.edu.om/science/Departments/Mathematics/Course-Outline
- Module handbook

Preliminary assessment and analysis of the experts:
SQU submits their module handbook during the accreditation process, which combines the module descriptions available on the webpage of the study program. The module handbook gives all necessary information about teaching methods, intended learning outcomes, content, admission and examination requirements, forms of assessment, details explaining how the final mark is calculated, and references. The experts appreciate the detail matrix on achieving the intended student learning outcomes. Yet, the experts remark that the module handbook is not complete; it does not include the necessary information about the

awarded credit hours and ECTS points and misses the module descriptions for the final project and other compulsory module from other study programs. For this reason, the experts expect SQU to update the module handbook of the bachelor program *Mathematics* and include all required information.

Criterion 4.2 Diploma and Diploma Supplement

Evidence:

- Example of diploma certificate
- Example of a Diploma Supplement
- Example of a Transcript of Records

Preliminary assessment and analysis of the experts]

The experts confirm that the students of the study program M*athematics* are awarded a Diploma certificate after graduation, which is accompanied by a Diploma Supplement and a Transcript of Records. The Transcript of Records lists all the courses that the graduate has completed, the achieved grades, and cumulative GPA. However, the Transcript of Records should also list the awarded ECTS credits points for each course according the conversion presented by SQU during this review. The experts add that the Diploma Supplement gives additional details on the study program (objectives and program learning outcomes) as well as on the grading system. All documents are issues in English.

Criterion 4.3 Relevant Rules

Evidence:

- Self-assessment report
- Webpage https://www.squ.edu.om/
- Webpage Department of Mathematics https://www.squ.edu.om/science/Departments/Mathematics
- Webpage Ba Mathematics https://www.squ.edu.om/science/Departments/Mathematics/BSc-in-Mathematics
- Student handbook “Undergraduate Academic Regulations”
- Student handbook “Academic Advising”
- Discussion during the audit

Preliminary assessment and analysis of the experts:
The experts confirm that SQU has presented evidence, which present the rights and duties of both the university and the students. They consider the student handbooks as well drafted. The experts conclude that the rule and regulations of students are clearly defined and binding. Moreover, the experts confirm that the admission regulations and regulations for transfer students are clearly presented on the Universities webpage.

Nevertheless, the experts notice that the students are not aware of all regulations and are not aware of the student handbooks. The experts highlight the importance to inform students on their rights and duties and the importance of transparent procedures and easily accessible documents. The representatives of the rector's office admit that SQU has issues a high number of policies, which might contribute to some confusion. According to them SQU is working on several initiatives to makes the information easily accessible for students and staff, such as short videos or an AI search tool to direct students and staff to the documents they are searching. In addition, they plan to review their policies to reduce them to a smaller number of main documents. The experts approve these ideas and support SQU revision of policies and regulations to ensure that employees and students are aware and understand their rights and duties.

Final assessment of the experts after the comment of the Higher Education Institution regarding criterion 4:

Ad criterion 4.1.

SQU did not comment on the issues detected in the module handbook. Thus, the experts decide on the requirement A3 and request an improved and complete module handbook. The module handbook should include all compulsory modules from the pre-major and major program. In addition, a module descriptions for all subject-specific electives needs to be provided.

Ad criterion 4.2.

The experts notice that SQU did not comment on the missing Diploma Supplement. Consequently, they decide on the requirement A4 and express the importance of such a documents for external stakeholders. In addition, the experts comment that a conversion from Omani credit points to ECTS credit points needs to be included in the Transcript of Records.

Ad criterion 4.3.

The experts appreciate that SQU aims to inform its students on their rights and obligations on multiple occasions and that SQU offers the main documents online. Still, the experts remain concerned and decide on the recommendation E6.

5. Quality management: quality assessment and development

Criterion 5 Quality management: quality assessment and development

Evidence:

- Self-assessment report
- Minutes of student-staff liaison committees
- Examples of student satisfaction surveys
- Examples of students' end-semester evaluations
- Data on employment of alumni
- Discussion during the audit

Preliminary assessment and analysis of the experts:
SQU describes in its self-assessment report that quality assurance includes various levels and tools. At the Department level, there is also a Quality Assurance Committee. The chair of this group will represent the department on college level unit on quality assurance. The program coordinators confirm that there are no student members on committee on quality assurance on department level. Nevertheless, students are active in the staff-student liaison committee. This committee consists of students and lecturers, who meet at least once a semester to discuss the concerns and problems of all students. The results of their meeting will be discussed within department board level to decide a plan of action. Their official form always include space for action plans, which need to be filled out and shared with the quality assurance unit on college level. Students are further organized in student councils. Students choose their representative for each department. The student council meets regularly transferring their minutes to various units to receive response. The students confirm to the experts that they are aware of the staff-student liaison; however, none of them is a member. They explain that they select two students of each cohort to join this committee (at least six students in total). They approach their student representatives if they have any issue/complaint they want to resolve with the lecturers. In addition, they can also directly contact the head of the department with any issue.

According to the submitted documentations, students further take part in the quality management on study program level based on their participation in various surveys. The stu-

dents confirm that they take part in the end-semester course evaluations (teaching evaluations). However, they have never received the results of any survey nor were they informed on any action taken based on their opinion. However, they acknowledge that improvements take place since they become evident during the next semester.

The experts further refer to the presented students' exit survey. As one point of criticism, students mentioned that the university is not concerned of the individual needs of the students and do not take interest in their development. The program coordinators mention that they are aware of these results and are still under discussion. They highlight that the number of replies is very low; therefore, they are still evaluating the severity of these issues. They add that these issues was certainly also discussed in the student-staff liaison committee.

The experts learn that the quality management on department level is performed in collaboration with a unit on college level and on the university level. The highest office at SQU is the Department of Quality Assurance and Academic Accreditation Committee, which oversees all quality processes and initiate new programs to improve quality management procedures. All processes aim for continuous improvement of the study programs through monitoring, assessing, and analyzing the teaching and learning methods. The experts learn during the on-site visit that other stakeholders are involved in the improvement of the study program, which include among others partners from industry and alumni.

The experts further want to discuss how SQU tracks the progress of its students. The program coordinators admit that monitoring students is a challenge, especially once student receive probation status. Student with a cumulative GPA lower than 2.0 enter probation station, which limits the number of courses they can take during the next semester and therefore prolongs their studies. The program coordinators mention that most students fall into probation during their foundation year or their pre-major. As one main reason, they mention that students have problems to adapt to learning at the university or learning in English. On probation, students can only take a maximum of 12 Omani credit points per semester, while average students take up to 15 credit points and exceptional ones to 18 credit points. All students at SQU have to take a minimum of nine credit points per semester. The program coordinators state that SQU is concerned that students graduate on time. Therefore, it offers special probation advisors, who offer guidance and counsel to students on probation. The experts learn that at COS, a specific committee with representatives of each department addressed the needs of students on probation. The program coordinators add that this committee acts proactively and identifies students "at risk" for receiving probation. They look through the students' progress and transcript of records to find potential candidates. These students receive consultation to prevent them receiving a probation status. The focus is on assistance in tackling each student´s specific problems and foster their

learning. Additionally, they provide advice for selecting useful courses to continue in their majors. The students add that all students receive an advisor once they enter their major. Usually, they meet with their advisor twice a semester (at the beginning and the end). The experts further inquire if there is an official connection between students and alumni. The students explain that they are not aware of any official interaction; however, they consider it as very helpful to discuss with alumni who are employed in jobs in the field they are interested in. Moreover, time to graduation can also be prolonged because students are not successful to enter their desired major. In this case, they take additional courses in the pre-major to increase their GPA.

In conclusion, the experts consider that SQU has established quality assurance measurements, which contribute to the continuous improvement of the study programs. The results of these processes are continuously incorporated into the development of the program and responsibilities are clearly defined. The experts appreciate that SQU has provided them with several questionnaires to document their various activities to collect feedback from different stakeholders. However, the experts note that SQU needs to intensify its collaboration with external stakeholders in the development of the bachelor program *Mathematics*. On one hand, they recommend improving the communication and tracking with alumni; on the other hand, the experts emphasize on the importance of partners from the industry for feedback. In this regard, the experts appreciate the newly formed Advisory Board on department level to collaborate in quality assurance processes to refine the profile and content of the study program. In the experts' opinion, this Advisory Board needs to meet as soon as possible and that their meetings should write minutes for records. The experts are convinced that SQU needs to ensure that all stakeholders are actively involved in the review of the study program. According to the experts, SQU should consider forming a joint committee of students, alumni, industry representative and other external stakeholders.

Final assessment of the experts after the comment of the Higher Education Institution regarding criterion 5:

SQU's statement did not contain any comments towards the feedback students on quality assurance processes they participate in. The experts highlight the importance of discussing and/or informing students on the results of their end-semester evaluation and additional surveys. As internal stakeholders, they are concerned for the development of their university and study programs. Therefore, SQU needs to ensure that the students receive feedback to close the quality management cycle.

D Additional Documents

No additional documents needed.

E Comment of the Higher Education Institution (26.07.2024)

The institution provided the following statement:

"Response on

ASIIN Draft Report for the accreditation of the bachelor program Mathematics.

Criterion 1.1 Objectives and Learning Outcomes of a Degree Programme (Intended Qualifications Profile)

***Experts**: "According to the expert panel, SQU should form a group/committee, where various stakeholders are able to give feedback to their different needs. This group should contain students, alumni, representatives from the university management and lecturers as well as industry representatives. "*

SQU-Department of Mathematics: The department greatly values using the advisory board's expertise to improve its programs. It's important to note that the advisory board comprises alumni, university management, lecturers, and industry representatives. Therefore, the department has successfully implemented the panel's recommendation by establishing a committee that includes diverse stakeholders.

Criterion 1.3 Curriculum

Experts: *"However, according to the submitted module descriptions and the referenced literature, the experts recommend extending the content of applied mathematics in the study plan. "*

SQU-Department of Mathematics: The department is highly valuing the expert's recommendation for extending the content of applied mathematics in the study plan. The department is reviewing the contents of its courses periodically and increasing the dose of applied problems in the degree plan is already in place.

Criterion 1.5 Workload and Credits

***Experts:** "Nevertheless, the experts would appreciate a more thorough documentation of the student total workload and a more detailed conversion scheme between the Omani credit system and ECTS "*

SQU-Department of Mathematics: The conversion of Omani credit points to European Credit Transfer and Accumulation System (ECTS) credit points is included in the diploma supplement under Section 4.4, Grading Scheme. However, the department would like to

point out that all course outlines and syllabus are currently under review in line with Oman Qualification framework (OQF) document providing information on the OQF Level , minimum OQF Credit Value of each qualification type, and more details scheme between Omani qualifications and Foreign or International qualifications (https://www.squ.edu.om/qao/QAO-DEPARTMENTS/Academic-Programs-and-CommunityService/Oman-Qualification-Framework-OQF)

The department of Mathematics has been requested by SQU to align the course outlines with the OQF.

Criterion 2 Exams: System, Concept and Organisation

***Experts**: "The experts observe that none of the module included in the module handbook includes projects or practical assessment components "*

SQU-Department of Mathematics: The courses MATH 5501(Final Year Project 1) and MATH 5502 (Final Year Project 2) are final-year projects listed in the module handbook. Typically, these courses involve pairs of students who meet weekly with a project supervisor to discuss and report on their progress. While some courses in our program include active learning through group projects, these specific projects are not detailed in the module handbook. For example, in the MATH 2201 course (Linear Algebra with Applications), students engaged in various projects such as Data Science with Matrices, Matrices in Java, and Cryptography and Linear Algebra. One standout project, 'Matrix Operations with Python and Arrays,' was selected for presentation to experts during an audit visit discussion.

***Experts**: "Nevertheless, the students inform the experts that they usually have quizzes or assignments every week ".*

SQU-Department of Mathematics: Selected courses incorporate active learning activities, which often include weekly quizzes or assignments for students. See Criterion 1.6

***Experts**: "The experts note that SQU needs to raise the scientific level of the final year project and ensure that students possess sufficient skills in scientific writing "*

SQU-Department of Mathematics The department appreciates the panel's feedback on enhancing the scientific rigor of the final year projects. It is important to note that these courses have been transformed into research-based courses. As a result, both their scientific depth and assessment are undergoing comprehensive review and enhancement.

Criterion 4.2 Diploma and Diploma Supplement

***Experts**: "*Nevertheless, the experts notice that the students are not aware of all regulations and are not aware of the student handbooks "

SQU-Department of Mathematics: The department is dedicated to this initiative. While all regulations and procedures are accessible to students via the university website and student handbook, the department is committed to further enhancing understanding through additional meetings with students throughout the semester. These sessions will emphasize key regulations and procedures to ensure clarity and compliance."

F Summary: Expert recommendations (19.08.2024)

Taking into account the additional information and the comments given by SQU, the experts summarize their analysis and **final assessment** for the award of the seals as follows:

Degree Programme	ASIIN Seal	Maximum duration of accreditation	Subject-specific label	Maximum duration of accreditation
Ba Mathematics	With requirements for one year	30.09.2031	–	-

Requirements

A 1. (ASIIN 1.1 & 5) Ensure that various stakeholders are involved in the review of the study program, including among others industry representatives (Advisory Board), students and alumni.

A 2. (ASIIN 1.3) The structure of the final year project needs to follow the structure of a scientific work and adhere to the principle of scientific writing.

A 3. (ASIIN 4.1) Prepare a module handbook, which contains module descriptions for all modules of the study program.

A 4. (ASIIN 4.2) SQU needs to provide the students with a Diploma Supplement according to the regulations of the European Higher Education Area. In addition, provide a conversion to ECTS credits in the Transcript of Records.

A 5. (ASIIN 5) Ensure that students are informed on the results and actions taken based on the surveys they participated in.

Recommendations

E 1. (ASIIN 1.1) It is recommended to increase the collaboration of different departments at SQU to strengthen the interdisciplinary in teaching and research.

E 2. (ASIIN 1.1 & 5) It is recommended that the Advisory Board of the Department of Mathematics meets as soon as possible. Regular meeting should be planned and documented.

E 3. (ASIIN 1.3) It is recommended to use more contemporary and applied examples and reading materials in the lectures.

E 4. (ASIIN 1.3) It is recommended to develop guidelines to integrate internships in the curriculum, who do not prolong the study duration. SQU should be responsible for the content and monitor the student learning progress during the internship.

E 5. (ASIIN 1.6) It is recommended to develop a strategy to use artificial intelligence within the study program.

E 6. (ASIIN 4.3) It is recommended to make students and staff aware of their rights and duties at SQU and facilitate easy access to information.

G Comment of the Technical Committee 12- Mathematics (09.09.2024)

Assessment and analysis for the award of the ASIIN seal:

The Technical Committee discusses the requirements and recommendations proposed by the expert group. This concerns the participation of stakeholders in the further development of the degree programme, the quality of the final theses, the module descriptions, the Diploma Supplement, and the feedback on the teaching evaluations. After a brief discussion, Technical Committee follows the assessment of the expert group and only makes minor grammatical improvements to recommendations E4 and E5. It also points out that requirement A2 belongs to the ASIIN 2 criterion.

The Technical Committee 12 – Mathematics recommends the award of the seals as follows:

Degree Programme	ASIIN Seal	Maximum duration of accreditation	Subject-specific label	Maximum duration of accreditation
Ba Mathematics	With requirements for one year	30.09.2031	–	-

Requirements

A 2. (ASIIN 2) The structure of the final year project needs to follow the structure of a scientific work and adhere to the principle of scientific writing.

Recommendations

E 4. (ASIIN 1.3) It is recommended to develop guidelines to integrate internships in the curriculum, which do not prolong the study duration. SQU should be responsible for the content and monitor the student learning progress during the internship.

E 5. (ASIIN 1.6) It is recommended to develop a strategy to implement artificial intelligence in the courses of the study program.

H Decision of the Accreditation Commission (24.09.2024)

Assessment and analysis for the award of the subject-specific ASIIN seal:

The Accreditation Commission discusses the procedure, especially about the need to conduct an internship. In general, the AC agrees that conducting an internship is useful. However issuing a recommendation to this effect is not supported, because it would mean to cancel other modules. Additionally, conducting internships are not common practice in Oman. The other proposed changes are accepted.

The Accreditation Commission decides to award the following seals:

Degree Programme	ASIIN Seal	Maximum duration of accreditation
Ba Mathematics	With requirements for one year	30.09.2031

Requirements

A 1. (ASIIN 1.1 & 5) Ensure that various stakeholders are involved in the review of the study program, including among others industry representatives (Advisory Board), students and alumni.

A 2. (ASIIN 2) The structure of the final year project needs to follow the structure of a scientific work and adhere to the principle of scientific writing.

A 3. (ASIIN 4.1) Prepare a module handbook, which contains module descriptions for all modules of the study program.

A 4. (ASIIN 4.2) SQU needs to provide the students with a Diploma Supplement according to the regulations of the European Higher Education Area. In addition, provide a conversion to ECTS credits in the Transcript of Records.

A 5. (ASIIN 5) Ensure that students are informed on the results and actions taken based on the surveys they participated in.

Recommendations

E 1. (ASIIN 1.1) It is recommended to increase the collaboration of different departments at SQU to strengthen the interdisciplinary in teaching and research.

E 2. (ASIIN 1.1 & 5) It is recommended that the Advisory Board of the Department of Mathematics meets as soon as possible. Regular meeting should be planned and documented.

E 3. (ASIIN 1.3) It is recommended to use more contemporary and applied examples and reading materials in the lectures.

E 4. (ASIIN 1.6) It is recommended to develop a strategy to implement artificial intelligence in the courses of the study program.

E 5. (ASIIN 4.3) It is recommended to make students and staff aware of their rights and duties at SQU and facilitate easy access to information.

Appendix: Programme Learning Outcomes and Curricula

According to self-assessment report the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the bachelor program *Mathematics*:

Program Objectives

- "To provide graduates with a coherent knowledge of mathematics, both in breadth and depth, on the principles and practice of the subjects.
- To produce graduates who can apply their mathematical knowledge effectively in interdisciplinary areas.
- To produce graduates with good communication skills.
- To produce graduates who can apply their acquired knowledge and skills in mathematics to solving real life problems.
- To produce graduates prepared for life-long learning and subsequent graduate studies.
- To produce graduates who can think analytically and critically."

Program Learning Outcomes

1. The ability to apply the knowledge and skills acquired in mathematics in solving real life problems.
2. The ability to identify, formulate and solve mathematical problems.
3. The ability to communicate effectively with a range of different audiences.
4. The ability to write reports clearly and legibly and systematically.
5. The ability to function effectively as a team player to accomplish a common goal.
6. The recognition of the need for self-improvement, and to seek more knowledge and skills in mathematics.
7. The ability to reach out and cope with complexities of interdisciplinary applications.
8. An understanding of professional responsibilities.
9. The ability to think analytically and critically, and to engage in innovative applications of mathematics in diverse areas.

The following **curriculum** is presented:

Department of Mathematics

Mathematics Study Plan for Cohorts 2021-2025

Categories	Credits
University Requirements (UR)	6
University Electives (UE)	6
College Requirement (CR)	3
College Electives (CE)	16
Departmental Requirements (DR)	19
Departmental Electives (DE)	12
Major Requirements (AR)	35
Major Electives (AE)	25
Total	**122**

	Course Code	Course Title	Cr.	Pre-Requisite/Co-Requisite*	Cat.
Semester 1	ARAB1060 or ARAB1019	Arabic Arabic for Non-Arabic Speakers (3 Cr)	2		UR
	HIST1010 or ISLM1010	Oman & Islamic Civilization Islamic Culture	2		UR
	LANC2058	Communication in Science	3	FPEL0560 or FPEL0600 or FPEL0601 or FPEL0602 or FPEL0603 or FPEL0604	CR
	MATH2107	Calculus 1	4	FPEL0560 or FPEL0600 or FPEL0601 or FPEL0602 or FPEL0603 or FPEL0604 and (FPMT0105 or FPMT0108 or FPMT0109)	CE
	STAT2101	Introduction to Statistics	4	FPEL0560 or FPEL0600 or FPEL0601 or FPEL0602 or FPEL0603 or FPEL0604 and (FPMT0105 or FPMT0108 or FPMT0109)	CE
	Total		15		

Semester 2	SOCY1005or SOCY1007+	Oman State and People Omani Contemporary Society	2		UR
	COMP2101	Introduction to Computer Science	4	FPEL0560 or FPEL0600 or FPEL0601 or FPEL0602 or FPEL0603 or FPEL0604 and (FPCS0101 or FPCS0102)	CE
	MATH2108	Calculus II	3	MATH2107	DR
	MATH2348	Foundations of Mathematics	4	MATH2107	DR
	STAT2102	Introduction to Probability	3	STAT2101 and (MATH2108* or MATH2109*)	DR
	Total	16			

+ For non-Omani Citizens

Semester 3	MATH2202	Linear Algebra I	3	(MATH2348 or MATH2350) and LANC2058	DR
	MATH3111	Calculus III	3	(MATH2108 or MATH2109) and LANC2058	DR
	MATH3302	Ordinary Differential Equations	3	(MATH2108 or MATH2109) and LANC2058	AR
		College Elective	4		CE
		University Elective	2		UE
	Total		15		

Semester 4	MATH2351	Advanced Calculus	3	(MATH2348 or MATH2350) and MATH2108	DR
	MATH3303	Linear Algebra II	3	LANC2058 and MATH2202	AR
	MATH3360	Discrete Mathematics	3	LANC2058 and (MATH2348 or MATH2350)	AR
	MATH3730	Computer Algebra System I	2	LANC2058 and (MATH2202 or MATH2201) and MATH3302 and (MATH3110* or MATH3111* or MATH3171*)	AR
	MATH4141	Numerical Analysis	3	(MATH2202 or MATH2201) and MATH3302	AR
	Total		14		

Semester 5	MATH4451	Real Analysis	3	MATH2351	AR
	MATH4453	Abstract Algebra I	3	MATH2202 and (MATH2348 or MATH2350)	AR
		Departmental Elective	3		DE
		Major Elective	3		AE
		Major Elective	4		AE
	Total		16		

Semester 6	MATH4452	Introduction to Complex Variables	3	(MATH3111 or MATH3110 or MATH3171) and (MATH2348 or MATH2350	AR
	MATH4474	Introduction to Partial Diff. Equations	3	MATH3302	AR
	MATH4351	Introduction to Metric Spaces	3	MATH2351 or MATH4450	AR
		Major Elective	3		AE
		Major Elective	3		AE
	Total		15		

Semester 7	MATH5101	Project in Mathematics – Part I	2	3 of the following courses MATH4141, MATH4451, MATH4452, MATH4453, MATH4474	AR
		Departmental Elective	3		DE
		Major Elective	3		AE
		Major Elective	3		AE
		University Electives (2 Courses)	4		UE
	Total		15		

Semester 8	MATH5102	Project in Mathematics – Part II	4	MATH5101	AR
		Departmental Elective	3		DE
		Department Elective	3		DE
		Major Elective	3		AE
		Major Elective	3		AE
	Total		16		