



ASIIN Seal

Accreditation Report

**Bachelor's Degree Programs in
Mathematics
*Statistics***

Provided by
Sultan Qaboos University, Muscat, Sultanat of Oman

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A About the Accreditation Process

Name of the degree programme (in original language)	(Official) English translation of the name	Labels applied for ¹	Previous accredita- tion (issu- ing agency, validity)	Involved Technical Commit- tees (TC) ²
Ba Mathematics	--	ASIIN	none	12
Ba Statistics	--	ASIIN	none	12
Date of the contract: 30.01.2018 Submission of the final version of the self-assessment report: 20.02.2018 Date of the onsite visit: 02-04.10.2018 at: Muscat, Sultanat of Oman				
Peer panel: Prof. Dr. Rüdiger Kiesel, University of Duisburg-Essen Prof. Dr. Eberhard Triesch, RWTH Aachen Prof. Dr. Manfred Berres, University of Applied Sciences Koblenz Dr. Marc Vandemeulebroecke, Novartis AG Mustafa Al-Ajmi, Student, German University of Technology in Oman				
Representative of the ASIIN headquarter: Dr. Iring Wasser				
Responsible decision-making committee: Accreditation Commission for Degree Pro- grammes				
Criteria used: European Standards and Guidelines as of 10.05.2015 ASIIN General Criteria as of 26.06.2015				

¹ ASIIN Seal for degree programs

² TC 12 – Mathematics

Subject-Specific Criteria of Technical Committee 12 – Mathematics as of 09.12.2016

In order to facilitate the legibility of this document, only masculine noun forms will be used hereinafter. Any gender-specific terms used in this document apply to both women and men.

B Characteristics of the Degree Program

a) Name	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
Bachelor of Science in Mathematics Bachelor of Science in Statistics	Level 6	Full time	no	10 Semester (including 2 semesters of non-credited courses in the framework of a foundation year)	122 SQU Credit Points	Intake twice/year since 1993; offered in current version since 2016 until 2020

The two programs under review have originally been offered in the Department of Mathematics and Statistics (DOMAS). In 2018, DOMAS was split up in a Department of Mathematics and a Department of Statistics, the latter being the first and only in the Sultanate of Oman tertiary education system.

According to the Self-Assessment report and the Department of Mathematics website, the **Bachelor of Science in Mathematics** program has been designed to achieve the following 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;

³ EQF = The European Qualifications Framework for lifelong learning

B Characteristics of the Degree Program

- To produce graduates who are able to 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.

The corresponding program objectives for the **Bachelor of Science in Statistics**, offered by the Department of Statistics, are as follows:

- To provide graduates with a coherent knowledge of Statistics, 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 are able to apply their acquired knowledge and skills in Statistics 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.

B Characteristics of the Degree Program

The following **curriculum** is presented for the Bachelor in Mathematics:

Semester 1	Course Code	Course Title	Cr.	Pre-Requisite/Co-Requisite*	Cat.
	ARAB1001	Arabic	3		UR
	SOCY1001	Omani Contemporary Society	1		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 FPMT0109)	CE
	STAT2101	Introduction to Statistics	4	FPEL0560 or FPEL0600 or FPEL0601 or FPEL0602 or FPEL0603 or FPEL0604 and (FPMT0105 or FPMT0109)	CE
Total			15		

Semester 2	HIST1010 or ISLM 1010	Oman & Islamic Civilization or Islamic Culture	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
	MATH2350	Foundations of Mathematics	3	MATH2107	DR
	STAT2102	Introduction to Probability	3	STAT1001 and MATH2108*	DR
	Total			15	

B Characteristics of the Degree Program

Semester 3	MATH2202	Linear Algebra I	3	FPEL0560 or FPEL0600 or FPEL0601 or FPEL0602 or FPEL0603 or FPEL0604 and (FPMT0105 or FPMT0109)	DR
	MATH3110	Calculus III	4	LANC2058 and MATH2108	DR
	MATH3302	Ordinary Differential Equations	3	LANC2058 and MATH2108	AR
		College Elective	4		CE
		University Elective	2		UE
	Total			16	

Semester 4	MATH3303	Linear Algebra II	3	LANC2058 and MATH2202	AR
	MATH3360	Discrete Mathematics	3	LANC2058 and MATH2350	AR
	MATH3730	Computer Algebra System I	2	LANC2058 and MATH2202 and MATH3302	AR
	MATH4141	Numerical Analysis	3	MATH2202 and MATH3302	AR
		Major Elective	4		AE
	Total			15	

Semester 5	MATH4450	Real Analysis I	3	MATH2108 and MATH2350	AR
	MATH4453	Abstract Algebra I	3	MATH2202 and MATH2350	AR
		Departmental Elective	3		DE
		Major Elective	3		AE
		Major Elective	3		AE
	Total			15	

Semester 6	MATH4452	Introduction to Complex Variables	3	MATH3110	AR
	MATH4474	Introduction to Partial Diff. Equations	3	MATH3302	AR
		Departmental Elective	3		DE
		Major Elective	3		AE
		Major Elective	3		AE
	Total			15	

Semester 7	MATH5501	Project in Mathematics – Part I	3		AR
		Departmental Elective	3		DE
		Major Elective	3		AE
		Major Elective	3		AE
		University Electives (2 Courses)	4		UE
	Total			16	

Semester 8	MATH5502	Project in Mathematics – Part II	3		AR
		Departmental Elective	3		DE
		Major Elective	3		AE
		Major Elective	3		AE
		Major Elective	3		AE
	Total			15	

[Last updated: 10 May 2016]

B Characteristics of the Degree Program

As regards the Bachelor in statistics, the following curriculum applies:

Semester 1 Fall	Course Code	Course Title	Cr.	Pre-Requisite/Co-Requisite *	Cat.
	ARAB1001	Arabic	3		UR
	SOCY1001	Omani Contemporary Society	1		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 FPMT0109)	CE
	STAT2101	Introduction to Statistics	4	FPEL0560 or FPEL0600 or FPEL0601 or FPEL0602 or FPEL0603 or FPEL0604 and (FPMT0105 or FPMT0109)	CE
Total			15		

Semester 2 Spring	HIST1010 or ISLAM1010	Oman & Islamic Civilization or Islamic Culture	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
	MATH2350	Foundations of Mathematics	3	MATH2107	DR
	STAT2102	Introduction to Probability	3	STAT2101, MATH2108*	DR
	Total			15	

Semester 3 Spring	Course Code	Course Title	Cr.	Pre-Requisite/Co-Requisite*	Cat.
	MATH2202	Linear Algebra I	3	FPMT0105/0109&FPEL0601/0602/0603	DR
	COMP2200	Fundamentals of Object Oriented Programming	3	COMP2101	AR
	STAT3334	Introduction to Inference	3	STAT2102 & LANC2058	AR
		College Elective	4		CE
		University Elective	2		UE
Total			15		

Semester 4 Spring	MATH3110	Calculus III	4	MATH2108 & LANC2058	DR
	STAT3335	Introduction to Sampling	3	STAT2102 and LANC2058	AR
	STAT3338	Statistical Methods	3	STAT3334 & LANC2058	AR
	STAT3336	Computational Techniques in Statistics	3	STAT2102, COMP2200 & LANC2058	AR
		Major Elective	3		AE
	Total			16	

B Characteristics of the Degree Program

Semester 5 Fall	STAT4432	Regression Analysis	3	MATH2202, STAT3334	AR
	STAT4433	Design and Analysis of Experiments I	3	STAT3338	AR
		Departmental Elective	3		DE
		Major Elective	3		AE
		Major Elective	3		AE
Total			15		

Semester 6 Spring	STAT4434	Non-Parametric Statistics	3	STAT3334	AR
		Departmental Elective	3		DE
		Major Elective	3		AE
		Major Elective	3		AE
		University Electives (2)	4		UE
Total			16		

Semester 7 Fall	STAT5521	Categorical Data Analysis	3	STAT3338	AR
	STAT5537	Multivariate Techniques	3	STAT3334, MATH2202, MATH3110	AR
	STAT5556	Project in Statistics I	3	STAT 4432, STAT 4433	AR
		Departmental Elective	3		DE
		Major Elective	3		AE
Total			15		

	Course Code	Course Title	Cr.	Pre-Requisite/Co-Requisite*	Cat.
Semester 8 Spring	STAT5536	Time Series Analysis	3	STAT 4432	AR
	STAT5557	Project in Statistics II	3	STAT 4432, STAT4433	AR
		Major Elective	3		AE
		Major Elective	3		AE
		Major Elective	3		AE
Total			15		

C Peer Report for the ASIIN Seal

1. The Degree Program: Concept, content & implementation

Criterion 1.1 Objectives and learning outcomes of a degree program (intended qualifications profile)

Evidence:

- Homepage of SQU: <https://www.squ.edu.om/science/Departments/Statistics/Academic-Programs/Undergraduate>
- Self Assessment Report
- Objectives-Course matrix
- Diploma Supplement

Preliminary assessment and analysis of the peers:

Both the Bachelor of Science in Mathematics as well as Statistics degree have been established first in 1993, originally with a credit working load of 150 SQU credits. The year 2010 witnessed a fundamental change in both programs due to the introduction of a so-called “foundation year” to better prepare students in the first two semester for the commencement of their studies in non-credited preparation classes and selecting their majors subsequently (see below for further explanations). The workload of the Bachelor programs subsequently has been reduced from 150 to 122 SQU credits, equalling 244 ECTS, according to the information provided in the sample diploma supplement.

In addition to the program objectives enumerated in the introductory part B above, the Self Assessment Report further specifies a number of additional program learning outcomes to be achieved by the prospective graduates of both programs under review:

- The ability to apply the knowledge and skills acquired in mathematics and statistics in solving real life problems
- The ability to identify, formulate and solve mathematical and/or statistical problems
- The ability to communicate effectively with a range of different audiences
- The ability to collect, organize, analyse and interpret data in statistical settings

- The ability to write reports clearly and legibly and systematically
- The ability to function effectively as a team player to accomplish a common goal
- The recognition of the need for self-improvement, and to seek more knowledge and skills in mathematics and/or statistics
- The ability to reach out and cope with complexities of interdisciplinary applications
- An understanding of professional responsibilities.
- The ability to think analytically and critically, and to engage in innovative applications of mathematics and statistics in diverse areas.

The expert team observes that the learning outcomes for both programs are identical and very generic in nature. Most of the interviewed stakeholders during the audit were not really in a position to define in detail what the graduates of both programs were being prepared for to succeed in their later professional lives. Many, e.g., did not see a perspective beyond the classical teaching profession for mathematicians, which in the past was the prime destination for graduates of the department and still today is the first answer given by the interviewed students. The department has recognized the need for opening new doors and further specialization by planning to introduce new majors in line with prior recommendations of external examiners. Originally, the idea has been to create new majors in financial mathematics, mathematical biology and industrial mathematics. So far, a major in financial mathematics is going to be implemented in the near future.

Refining the competence profiles is all the more an urgent necessity as in the past couple of years the Omani job market has undergone a rapid transformation. Whereas in the past, graduates with a background in statistics and mathematics were frequently finding an occupation in government ministries (e.g. Economy, Commerce, Health, Defence, (Higher) Education, Petroleum or the Royal Oman Police force), this previously predominant career path as a public servant has become much more difficult to engage in. The current moratorium in government hiring is due to a lack of public finances in the wake of the drop in oil prices and constitutes a challenge for the current generation of graduates. More and more graduates have to find employment in the private job market or are in need of creating their own business, for which they are not well prepared. An exception to this general finding is the minor in health statistics, where male graduates have an employment guarantee to work for the ministry of health.

The peers, after speaking to all stakeholders, point to the fact that there are much broader job perspectives for future graduates than is currently envisaged. They allude to the existence of many optimization processes in various parts of Oman industry (e.g the energy sector, aviation, the logistics sector etc.), where mathematicians and statisticians can bring

their unique qualifications to bear. They strongly suggest that the department should make these job options visible to the public to make the study programs more attractive. This particularly holds for the mathematics program. The experts conclude, that the program learning outcomes for both programs under review must be adapted in cooperation with all stakeholders to reflect more accurately existing and future job profiles.

A final verdict whether the intended qualifications profiles allow students to take up an occupation which corresponds to their qualification (professional classification), is difficult to render, as precise information about the career profiles of past and future graduates were lacking at the time of the audit. With the help of additional information rendered only after the on-site visit, the department reports that the SQU is currently in a process for creating a national database for its graduates. This database is supposed to collect records of all its graduates from the year 2016 onward in coordination with the Centre for Career Guidance (CCG). This project has not yet commenced and fully implemented for the two departments in mathematics and statistics. Consequently, job profile of SQU's BSc Mathematics and BSc Statistics graduates, is available only for the period 2009 – 2015. The experts deem it necessary to refine this "tracking system" to learn about the period until when a graduate is securing a job in line with his qualifications, his job destinations in changing times, the obtained salary level and so forth. The information gained must be used to draw appropriate conclusions about the future development of the two programs under review.

Finally the peer group deals with the question, whether the objectives and learning outcomes of the two degree programs reflect the intended level of academic qualification and correspond with the Subject-Specific-Criteria (SSC) of the Technical Committee 12 – Mathematics of ASIIN. They conclude that the graduates of both degree programs obtain necessary fundamental knowledge and competences for a professional career in the area of mathematics and statistics, with a number of reservations mentioned in subsequent parts of this report.

Criterion 1.2 Name of the degree programme

Evidence:

- <http://www.squ.edu.om/ar/Admission/Undergrag>
- Self-Assessment Report
- Discussions during onsite visit

Preliminary assessment and analysis of the peers:

The panel discusses the names of the two programs under review in relation to the intended objectives, curriculum as well as the degree awarded. The names of the degree programs correspond well with the intended aims and learning outcomes as well as the course language. The language of instruction for both the Bachelor in Mathematics as well as the Bachelor in Statistics is English and is clearly indicated on the website under <http://www.squ.edu.om/ar/Admission/Undergrag>.

Criterion 1.3 Curriculum

Evidence:

- Curricular overview as published on the website: <https://www.squ.edu.om/science/Departments/Statistics/Academic-Programs/Undergraduate>
- Course handbook
- Learning units matrix
- Discussions during onsite visit

Preliminary assessment and analysis of the peers:

The curricular structure of the two programs under review is referred to and depicted as map in the first part of this report. The panel acknowledges that the curriculum is divided into learning units and courses, which form the educational pathway. As an appendix to the Self-Assessment Report, the experts have been provided with a comprehensive course handbook containing all essential information such as the course title, the attached credits, the prerequisite courses, a course description including the teaching/learning strategies, the forms of assessment and grading methods, the used textbooks and supplemental material. The document is published on the university website (www.squ.edu.com.om/science/Undergraduate) as well as on the website of DOMAS (www.squ.edu.om/science/Departments/Mathematics-and-Statistics). It is accessible to all stakeholders. At the time of

the audit, course descriptions for the so called “university requirements” (e.g. Arabic, Omani Contemporary Society and Omani Civilization or Islamic Culture) were not available. On request of the experts, these were handed in subsequently.

As to the revision for the two Bachelor programs under review, there are several interacting processes taken place simultaneously. A major internal review process for the programs in mathematics and statistics is undertaken every five years. The latest revision took place during the period fall 2015-spring 2016 including a revision of the degree programs and its individual courses. In addition to the policy of revising a curriculum every five years, the College of Science on a regular basis commissions external international examiners as part of the SQU’s Academic Program Reviews (APR policy). In preparation of this external review, a Self Assessment Report is being compiled, followed by an on-site visit of the reviewers and the adopted of their recommendations in the Department Curriculum Committee (DCC).

The results of the external evaluations and the internal review regularly feed into the design of the revised programs (such as the introduction of the foundation year, the increase in the number of department electives from 9 to 12 in the last revision of the programs, the introduction of new specialities, e.g. financial mathematics, the recruitment of additional personnel etc.). Other topics such as the different numbers of tests and the distribution of marks for courses, the high failure rates in certain courses such as real analysis, calculus II, linear algebra, and abstract algebra have been equally addressed in the past, though the experts have further comments on these issues (see below).

While from an overall perspective the structure of the curriculum is in line with expectations, there are however a number of elements which are of concern and consequently need further attention. These are also described in further detail under section 2.1 of this report.

In terms of alignment of the module learning outcomes with the overall programme learning outcomes/competence profiles, the faculty has provided for each of the courses an objectives-course matrix, matching the learning outcomes with the SQU program learning outcomes.

According to the curriculum, the ASIIN requirements appear to be fulfilled. However, the peers learned that difficult problems are not posed in the homework during the first 4 semesters and the students reported that they did not understand parts of what is essential for a mathematician. Students should be confronted with theoretical problems that cannot be solved by routine calculations. They should also be able to solve mathematical and statistical problems with mathematical and statistical software on a computer.

Criterion 1.4 Admission requirements

Evidence:

- Admission regulations: <http://www.squ.edu.om/ar/Admission/Undergrag>
- Data about applicants and admitted students for the past five years in the self-assessment report

Preliminary assessment and analysis of the peers:

The panel members discuss the entrance requirements with the programme leadership. Admission to the SQU College of Science (in the framework of which the undergraduate programs in statistics and mathematics are offered) is open to students having successfully passed the Omani school-leaving certificate. The admission requirements are laid down in the admission requirements (<http://www.squ.edu.om/ar/Admission/Undergrag>) and are made available through the Office of the Assistant Dean for Undergraduate Affairs to students and other interested stakeholders.

All Students, before choosing a specific program within the College of Science are first required to pass a yearlong “Foundation Program” (only a small percentage of high school students may be exempt if they score high on the “exit tests”). Only after the successful completion of a certain number of designated courses within this foundation program in 4 disciplines (English language, mathematics, information technology and preparatory studies at SQU) is the respective student permitted to apply for a specific major such as engineering, statistics and mathematics.

The student in this process has to identify preferred choices as to his major, but the final assignment to one of the majors is done on a competitive basis, taking into consideration the final grades of the applicant. There is a seat limitation for each cohort. If a student does not match the eligibility criteria for his first choice of major, he will be enrolled his second or third choice. As many students are choosing engineering or computer science as their preferred choice, the underperformers are usually been left with the least favourable majors, which are often statistics and especially mathematics. This is unfortunate for the department. Efforts need to be taken to make the study programs more attractive, to show job opportunities and to offer internships, so that mathematics becomes the first choice of students. If the student fails altogether, he must repeat certain key course or is being transferred to another College within SQU.

As regards the admission process, the peers recognize that it is a highly selective process with only the best 5% of high school graduates having a choice to enrol in the first place.

The admission process in SQU claims to be based completely on merit. The experts see however two exceptions to this rule:

On the one hand, they note that the general admission policy of the department of science foresees an enrolment split of 50%:50% between male and female students. As female high school graduates are performing generally notably better on average than their male counterparts, this leads to a discrimination of well performing women whose places are taken by male high school graduates in order for them to reach the 50% threshold.

On the other hand, there is a specific admission track for the health statistics minor, which has been requested by and is paid for by the ministry of health, and has certain restrictions to comply with. Notably, this specific program is open exclusively to male students due to the quest of the ministry to have a better balance between female (majority) and male (minority) employees in the ministry.

The peers recommend rethinking this admission policy especially in this health statistics minor before the background that the number of male enrolments has diminished considerably in recent years and that on a more general level admission should be based on merit and not on gender requirements.

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

The peers appreciate the detailed statement of the University regarding the peers' criticism and feedback, especially pertaining to the peers' proposed improvements. With regard to the "tracking system", designed to follow up on graduates' success in the labour market, the University acknowledges the importance of updating this system for graduates past 2016 and informs the peers that the SQU has already started providing all necessary job related information for the graduates from 2016 onwards. The department also acknowledges the peers' suggestion to market more intensively the job perspectives for future graduates of Mathematics and Statistics. The department indicates that the industry base in Oman is not as elaborate for Mathematicians and Statisticians as it may be in Western countries. Still, the department will address the issue of making career opportunities more prominent and visible to the public, e.g. through their websites, the SQU job fairs and the periodic alumnae get-togethers. The peers commend these provisions of the University as they believe that the implementation of a "tracking system" of graduates in combination with a broader advertisement of job opportunities will further the potential career of the University's graduates.

The peers thank the University for clarifying the revising procedure for the curricula and especially the distinction in the roles of the external examiners and the external reviewers for each program. The external examiners have been coming to the various departments of the College of Science on a three-year basis ever since 1991, while the three external reviewers of the Mathematics program have visited SQU in November 2016 under the SQU

Academic Program Review task. With regard to the curriculum, the University also clarifies that the nature of quizzes and homework in the first four semesters is not generally “easy” but rather fits the nature of the taught content, which tends to be more technique-based. The peers understand this relation between the content of the lesson and the homework. The University clarifies furthermore that they understand the need for students being able to solve mathematical and statistical problems with computer software. Hence, adequate software and computer labs especially for this purpose have already been established and are teaching students to utilize software such as Matlab or MINITAB. The peers thank the University for this clarification and acknowledge that efforts are made to train the students efficiently in the application of computer software. Yet, they recommend to consider the role of the “R” programming in the statistics curriculum as appropriate.

Finally, the peers understand that the admission policies for the two study programs are related to the policies of SQU administration. This regards the 50/50 ratio of male and female students as well as the restriction of female students to enter the health statistics minor. While the peers understand that admission policies are operated centrally, they nonetheless recommend that admission should be based more on qualification and less on gender. However, the peers would like to point out that this matter will be of great importance during the next re-accreditation of these study programmes.

While during the audit, the peers got the impression that mathematics and statistics were two unfavourable study subjects, they are glad to hear that students recently no longer choose majors in mathematics and statistics as their last option and that overall the image of these two study programmes is about to improve.

The peers once again thank the University for their detailed response and the measures already undertaken to sharpen the study profile, to track the graduates’ success and to establish a more adequate level of studying. However, the peers still urge the University to adapt and publish the program learning outcomes and competence profiles of both study programmes in order to reflect more accurately existing and future job profiles. Hence, the peers assess criterion 1 as only partially fulfilled.

2. The degree programme: structures, methods and implementation

Criterion 2.1 Structure and modules
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Evidence:

- Course descriptions available on the website

- Objectives-Modules-matrix
- SQU Undergraduate Academic Regulations
- Discussions during onsite visit

Preliminary assessment and analysis of the peers:

The curricular structures of both programs under review are referred to and depicted as map in Part B of this accreditation report. As mentioned before, the students graduating from high school are first required to enrol in a one-year foundation year, where they are familiarized with notions of basis sciences and mathematics. Also during this introductory year, intensive training in English language and conversation is taking place. The experts positively note that the English language capabilities are overall of a comparatively good quality due to this intensive language training in the transition year.

As to the structure of both the Bachelor in Mathematics as well as in Statistics, they are both equally divided into the following different “course categories”:

The so-called University Requirements and University Electives (6 credits each), the College Requirements and College Electives (3 and 16 credits respectively), finally the Departmental Requirements (16 credits) and Departmental Electives (12 credits). Once a student has chosen his major, he is tasked to enrol in Major Requirements and Major Electives of 32 Credits and 31 credits respectively.

As to the content of the Bachelor in Mathematics, the 122 credits are distributed as follows:

In the first semester, part of the credits are devoted to University requirements such as Arabic and Omani Contemporary Society plus the Department requirement: “Communication in Science”. In addition, students enrol in “Introduction to Statistics”, “Calculus I”. In the second semester, they are requested to take “Calculus II”, “Foundations of Mathematics”, “Introduction to Probability” as well as again the University requirement (“Omani & Islamic Civilization/Islamic Culture) and finally “Introduction to Computer Science”. In the third semester, the required courses are “Linear Algebra I”, “Calculus III”, “Ordinary Differential Equations” as well as one college and one university elective. This is followed by “Linear Algebra II”, “Discrete Mathematics”, “Computer Algebra Systems”) and “Numerical Analysis” plus one major elective in semester 4. In the fifth semester students enrol in “Real Analysis I”, “Abstract Algebra I”, one departmental elective and to major electives. Semester 6 consists of courses in “Introduction to Complex Variables, “Introduction to Partial Differential Equations” plus again one departmental and two major electives. The final two semester are devoted to a yearlong capstone project (project in mathematics I and II) plus 5 major electives and two departmental electives.

As regards the content of the Bachelor in Statistics, the first two semesters are identical in content to the Bachelor in Mathematics. In the third semester, students in statistics also take “Linear Algebra I”, “Fundamentals of Object Oriented Programming” as well as “Introduction to Inference” plus Electives. In Semester 4 they enrol in “Calculus III” plus “Introduction to Sampling”, “Statistical Methods” as well as “Computational Techniques in Statistics” as well as Electives. This is followed in Semester 5 by “Regression Analysis” and “Design and Analysis of Experiments” plus a certain number of Electives. In Semester 6, it is “Non-Parametric Statistics” plus electives, and the final two semesters are again devoted to a final projects (worth 6 credits) plus “Categorical Data Analysis”, “Multivariate Techniques” and “Time Series Analysis”.

While the experts, generally speaking, are confident that the program learning outcomes can be reached by the proposed curricula, they see room for improvement in the following areas:

In the **Bachelor of Mathematics** program, the experts are convinced that ongoing mathematicians should be taught the basic theories as Calculus and Linear Algebra by giving rigorous proofs for all the essential theorems from the beginning. Real and complex numbers with all their basic properties should be introduced during the first year. According to the present curriculum, Calculus I is taught without giving proofs and without discussing the completeness of the real number system. The latter is only introduced in the course Real Analysis I in semester 5, which also covers such basic concepts as continuity, uniform continuity, compactness for the first time in a rigorous way. Following this schedule, the students would see a proof of fundamental theorems of Calculus at the end of semester 5 for the first time which is much too late.

The core problem seems to be that a course like Calculus I is attended by all beginners in the College of Science, at a time where they do not know for themselves whether they are going to become, e.g., engineers, physicists, computer scientists or mathematicians. We strongly recommend separating the mathematics courses for mathematicians from the courses for the other users of mathematics as early as possible and can think of several ways to realize this.

One possibility, e.g., would be to offer a general mathematics course for all students in semester 1. The course could serve to lift the mathematical knowledge of the beginners to university level and could contain some Calculus and Linear Algebra. Then, in semester 2, offer different courses for mathematicians and the other users of mathematics.

For the **Bachelor in Statistics**, the expert panel sees a need for more active teaching in data analysis with statistical software. A thorough introduction into a statistical computing platform, preferably R, which is arguably the most relevant open platform today, is a necessary

prerequisite for analysing (preferably real) data in all statistics modules. For courses like Statistical Methods, Regression, Nonparametric Statistics etc. actual data should be used to have a more hands-on approach on data analysis. In the Health Statistics program the analysis of censored data is indispensable. Kaplan-Meier estimators and log-rank test should be included in these modules.

The experts positively note the existing system of electives. Degree diversification take place mainly through minors (a group of pre-assigned courses from a different field comprising mostly electives with altogether 18 credits). At present, there are 9 minors available to a mathematics major, namely minors in astronomy, biology, business, chemistry, computer science, earth sciences, nuclear sciences, physics, soil and water sciences as well as statistics respectively (for the statistics major mathematics can be chosen as part of the minor). The limiting factor is however the availability of placements in those minors which are limited (during the audit, e.g. students reported not being able to choose the Business option due to a lack of places).

As regards practical elements in the study program, the peers observe that they should be subject to further attention. Students during the audit expressed a strong wish to be exposed to more practical applications of the conveyed theory, thereby giving students the necessary exposure to be able to choose successfully future career paths. There is a requirement for an internship for the health statistics minor, which is properly credited and highly valued. This compulsory internship is however otherwise not an integral part for the two study programs under review. The experts recommend making internships a compulsory and credited component in both programs under review.

Criterion 2.2 Workload and credits

Evidence:

- SQU Undergraduate Academic Regulations
- Module (learning unit) descriptions available on the website
- Discussions during onsite visit

Preliminary assessment and analysis of the peers:

The panel discusses the credit point system in use at SQU and the department of mathematics and statistics (as specified by the SQU Undergraduate Academic Regulations) and its comparison to the European credit system ECTS. Since the introduction of the so-called

Foundation year, the number of credits in both programs has been reduced from 150 to 122 SQU credits. These credits are distributed nearly evenly over 8 semesters.

A normal semester at SQU is of 15-week duration. Practically all courses are carrying either 3 credits (equivalent to 4 classroom contact hours per week or 60 contact hours per semester) or 4 credits (equivalent to 5 classroom contact hours per week and 75 contact hours per semester). A student not on probation takes typically a 15 credit load during a semester (exceptional students can register up to a maximum of 18 credits, students on probation, who have a CGPA of below 2.0) for no more than 12 credits). This means that a student is having around 300 contact hours with staff per semester, the number of hours devoted to self study is not further specified. It is not clear, how the current Omani credit point system is being converted into ECTS credits. The technical conversion rate is 1 Omani Credit point equals 2 ECTS, as according to the Diploma Supplement the 122 Omani credits translate into 240 ECTS due to the fact that the ECTS is a work load based credit point system which in addition to the contact hours includes the independent educational work (homework assignments, preparation for exams e.g.).

As a result of a previous ASIIN accreditation visit and the requirement to introduce a work load survey which could be connected to the course evaluation that takes place every semester, an extensive internal survey as of November 2017 involving all the mathematics and statistics courses took place. During the audit, it however becomes apparent, that this survey has been a rather a technical fulfilment of this requirement without a thorough analysis or conclusions to be drawn from the data.

The peers see a continued necessity to come up with a workload based credit point system going beyond the number of contact hours.

As to the progression and completion rates of students and graduates of both programs under review, no reliable figures were available during the time of the audit. In the interviews with the students, practically all of them reported not to be able to finish their studies in the standard period of study. On average, all of them took 6 years to complete their studies. As data, provided by the department after the review visit suggests, this is indeed an area to look into and should be another incentive according to the experts to conduct a realistic workload analysis.

Criterion 2.3 Teaching methodology

Evidence:

- Self-assessment report and discussions during onsite visit

- Module (learning unit) descriptions available on the website

Preliminary assessment and analysis of the peers:

In the Self-Assessment report, it is mentioned that a typical class size amounts to around 35-40 students. Courses with larger numbers of student population are split into numbers of sections to be taught by a team of instructors under a coordinator. The various teaching methodologies are described in the course handbook and contain a variety of different teaching styles. The peers also witnessed two lectures during their onsite visit, in which they gained a good impression. In the subsequent discussions with students and alumni, this criterion was evaluated less favourably. Judging from the answers obtained during the audit, so far the teaching style is rather teacher- and not student-centred. Whereas there are very good examples to the contrary, a good part of the lectures according to the students can be characterized by ex cathedra teaching. Students especially in the Bachelor of Mathematics reported not really to understand what they were supposed to learn, referring to a mechanistic copying of solutions provided by the teachers. The mathematics program thus on the one hand should include mathematical reasoning, conducting proofs and challenging homework at the earliest-possible time. On the other hand, more room should be given to practical topics of solving mathematical and statistical problems with application software.

The experts recommend reinforcing more interactive forms of student learning, making sure that analytical learning and critical thinking skills are sharpened. This also relates to the quality of homework assignments given to students. Instead of doing multiple choice tests and repetitive quizzes, for which the solutions are frequently done by “copy and paste” (see below under examinations), the peers rather favour fewer, but more substantive homework assignments in the form of “mini-projects” to train analytical capacities. There also should be more practical elements such as data analysis solving optimization problem with software. This change in didactics is also connected to a reform of the exam system, as is elaborated under criterion 3.

Criterion 2.4 Support and assistance

Evidence:

- Self-assessment report
- Discussion during the onsite visit

Preliminary assessment and analysis of the peers:

SQU provides a comprehensive support system for all students during their studies. It includes consultations with academic advisors (comprising pre-major, major and special advisors appointed by the DOMAS board) about the individual study plans and problems related to their studies. As of last year, a so-called “Student Advising Form” has been developed, which tries to formalize and systematize these feedback sessions with the advisors/professors. Students not performing well in a semester can go into the probation status. This typically occurs when his CGPA falls below 2.0. The department has a mechanism to assist students to come out of the probation status, e.g. by academic advising or by referring them to SQU Counselling Centre.

In the experts’ eyes, the support system is a strong point of the two programs under review. During the discussion with students and teaching staff, it has become apparent that overall students generally appreciate the support and assistance provided to them and the peers commend the faculty for the good and trustful relationship between the students and the teaching staff. Overall, there are enough resources available to provide individual assistance, advice and support for all students. The support system helps the students to achieve the intended learning outcomes and to complete their studies successfully, albeit with some delay. The students are well informed about the services available to them.

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

The peers commend the Universities detailed response and feedback and especially their specific set of actions to implement the peer group’s suggestions and criticism.

With regard to criterion 2.1. – structures and modules – the peers understand that a change of the outlines of the mathematics courses will also affect the degree plans of other departments. The University shows awareness to the fact that a certain level of mathematical knowledge can only be adequately learned in classes specifically designed for students of mathematics and not for non-mathematical students. As such, the peers are pleased to learn that the University plans to introduce a new course during the third semester, which follows the modules Calculus II and Foundation of Mathematics. In this course, they will teach students about advanced topics such as the Heine-Borel Theorem, the Bolzano-Weierstrass Theorem or the limits of functions. As a follow up to this course, the University also plans to modify the content of the course Real Analysis I to include any theoretical concepts related to the three calculus courses that are not covered by the new course. The peers appreciate the effort the University has already undertaken in developing its mathematical program and hopes to see these changes being implemented in the near future.

Concerning the need for more active teaching in data analysis with statistical software in the Statistics programme, the peers learn that the University plans to make the course “Data Analytics”, which has not been offered for some time, part of their main curriculum again. Similarly, they take note of the University’s decision to change the course “Survival Analysis”, dealing with censored data, K-M estimators and log-rank tests, from an elective to an integral part of the minor in health statistics. As regards the utilization of R for analysing real data, the peers are informed that students are already encouraged to use this programme in their assignments or their final project. Likewise, the University reports that the students are already utilizing actual data in courses such as Statistical Methods or Non-parametric Statistics. The peers appreciate this clarification and support the University in advancing their active teaching in data analysis.

During their on-site visit, many students expressed their wish to pursue an internship during their studies, a wish the peers see as helpful in supporting the students’ practical training and increasing the students’ chance of successful employment after graduating. While the peers can comprehend that it might be more difficult to find internship opportunities in Oman, they nonetheless argue strongly in favour of the University developing a system that supports the mobility of their students.

The University points out that SQU is following the American Credit System across all its academic programs as a matter of policy. It is thus not possible to change the system to a workload based credit point system, which the peers see as a necessity.

Concerning criterion 2.3 – teaching methodology – the peers consider the department’s response regarding the ex cathedra teaching methods. Yet, the peers remain with the impression they got during the on-site visit and especially the discussions with the students and encourage the University to foster the mathematical reasoning of their students. The peers are pleased to see that the University shares their idea of reinforcing more interactive forms of learning and so called “mini projects” that support the student’s analytical learning and critical thinking skills.

The peers commend the University’s detailed response and assess criterion 2 to be partially fulfilled.

3. Exams: System, concept and organisation

Criterion 3 Exams: System, concept and organisation
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Evidence:

- Module (learning unit) descriptions available on the website

- DOMUS Examination Manual
- Discussions during onsite visit

Preliminary assessment and analysis of the peers:

The experts are informed that there is a university wide assessment system in place, which foresees for every study program/every course a compulsory combination of all three of the following assessment components: assignments, quizzes, and in-term/midterm/final exams. Each component of this continuous examination scheme has a percentage range approved by the respective department board.

The details of the examination system are transparently regulated in the DOMAS examination manual. In addition, at the outset of the course, students are given a course outline which includes details of the course assessment. The final grade is ranked in accordance to the international ECTS grade system with letters in descending order, from “A” to “F”. There is also an ongoing monitoring of the students progress in his studies (see above). Attendance is checked for each course. The rules for re-sits, disability compensation, illness and other circumstances are written down in the SQU Undergraduate Academic Regulations and therefore transparent to all stakeholders.

In spite of these general university wide assessment rules, it remains the prerogative of each individual lecturer, how many exams in these three categories he conducts, there is no department policy on this. In the experts’ view, the number of exams for the two programs under review is rather high. They see a triple negative effect in the current extensive examination scheme. First, the quality of the exam in their eyes is more important than the quantity, second there needs to be sufficient time for preparation of students and third there is also the danger of a potential overload of teaching staff, which – in the absence of a sufficient number of teaching assistants – invests considerable time in grading exams.

In view of the above, the peers before this background request that there is a maximum of no more than one midterm exam per semester. They furthermore recommend that there should be a reading week during the midterm exam period, e.g. that the week in which midterms are executed, does not contain additional courses to attend as students were complaining about a lack of preparation time. Similarly, the peers strongly argue in favor of reducing the number of quizzes and instead strengthen the quality of substantive independent homework assignments, involving “mini-projects” that could help students to apply their knowledge and to develop critical thinking skills and analytical capabilities. The experts also see value in having more oral examinations instead of written exams; the former are only demonstrated during their final project.

In the discussions with students, there is frequent mentioning of preparing for and doing examinations without understanding the content behind the exercises. This unfortunate situation is reinforced by the execution of quizzes in the past. Students very openly admitted that frequently they were facing “familiar tests”, which had been given in previous year. To succeed, copy and paste was thus good enough. To counter this development, it is recommended using available computer programs, by which each student is getting a separate task so that they cannot copy from each other. As these computer programs also mark the results automatically this would solve the problem of teaching being overloaded by grading too many quizzes.

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

The peers are pleased to hear that in most of the courses in both programs since Spring of 2018, there exist only one mid-term exam per semester. They affirm that this should be expanded to *every* course to lessen the workload of the students. In line with this, the peers also reassert the possibility of introducing a reading week during the midterm exam period. While the peers understand that this implies a “loss” of lecture days, they assure that it will also mean more time for the students to prepare for their exams adequately.

The University informs the peers that they have a well-set invigilation framework in place, which prevents cases of cheating and copying during exams. Yet, the peers reaffirm the feedback they received during the on-site visit and urges the department to increase their efforts, e.g. through computer-based exam design or in other ways they deem appropriate.

After having assessed the University’s response, the peers regard criterion 3 as partially fulfilled.

4. Resources

Criterion 4.1 Staff

Evidence:

- CVs of staff members/Staff handbook
- Information about research projects
- Discussions during onsite visit

Preliminary assessment and analysis of the peers:

During the audit, the panel learns that the Department of Mathematics and Statistics is among the largest academic departments at SQU. DOMAS recently has been split up in two

separate departments with altogether 52 full time equivalents of staff under contract. **As regards the newly founded department of mathematics**, there are 41 staff members with employment contracts, of which 10 reportedly are full professors (nine are identified in the staff handbook with one CV missing), among them 9 belonging to the applied mathematics field with only two full professor representing pure mathematics. **Concerning the department of statistics**, 11 staff members are employed, with no full professor among their ranks.

There are practically no visiting professors in the two programs under review, most of the staff are sitting on temporary assignments. The staff has a very international composition, with 40% of staff being Omanis, the rest foreign lecturers of multiple national origin. Regarding the age structure, there is a considerable number of professors who are shortly before retirement. The department is advertising for new recruitments and invests in the further qualification of promising candidates from their Master and Ph.D. programs. The process of academic staff appointments in DOMAS is overseen by so-called "Appointment Committee" comprising 5 members.

The interviewed alumni in retro perspective were overall satisfied with the delivery of the programs but also requested to modernize the content of teaching and to be able to participate in research during their Bachelor studies. As was mentioned before, Staff is generally responsive to problems and criticism, and there is a process in place to collect student feedback at the end of each course. The professor is requested to draw a report and react to these queries. The results should however be discussed with the students, the feedback loop should be closed.

The peers overall rate the current staff composition as sufficient to deliver the two programs under review, but see a necessity for upgrading, diversifying and rejuvenating the academic staff composition, also by reinforcing existing promotion schemes. They strongly recommend to increase the number of full professorships in the department, to find a better balance between pure and applied mathematics staff on the one hand, but also to have a least one full professor representing the statistics department. As a considerable number of colleagues are shortly before retirement, there is a good chance to do this. The experts can confirm that enough resources are available for teaching (an average workload of 10-12 hours per week applies), administrative tasks and supervision and guidance of the students.

Marking exams is time-consuming, but suggestions of the peers to this regard can be found under criterion 3 in this report.

In terms of research, the output is limited but overall sufficient. The peers nevertheless see room for improvement, as publications need to be published in more prominent international journals as is currently the case.

Criterion 4.2 Staff development

Evidence:

- Self-assessment report
- Discussions during onsite visit

Preliminary assessment and analysis of the peers:

There are a number of support systems in place investing in staff development at DOMAS. On the one hand there is a provision for Omani graduates, who join the department as so called “demonstrators” to continue their studies and complete their MSc and PhD degrees under SQU sponsorships, frequently at prestigious overseas universities for graduate studies.

There are in-house training facilities for staff members provided by Center for Educational Technology (CET) to upgrade their use of educational technology and e-learning. Staff members can profit from sabbatical leave periodically at overseas institutions for research collaborations and development. This however seems to be only the case for Omani staff. The experts before that background recommend extending these support measures to all staff regardless of origin or citizenship.

SQU also is operating a system of providing research grants to approved research projects (one to three years’ duration) through Internal Grants as well as His Majesty (HM) Grants, via Deanship of Research. The Research Council, a national research body, also provides research grants to staff on competitive basis.

SQU encourages as well as provides financial support for organizing high profile activities such as international conferences and workshops, and for participating in conferences abroad. Regular weekly seminars organized by the department’s *Seminar Committee* is an important activity. This allows both DOMAS academicians as well as visiting academics/researchers, including DOMAS graduate students, to present their research findings. While the research output of the department is sufficient, these support mechanisms should however be used to encourage members to publish in the very best journals in the field.

In the discussions with staff members, it is confirmed that there are sufficient support mechanisms and opportunities for members of the teaching staff who wish to further develop their professional and teaching skills. At the same time they point to time limitations

due manifold other activities (e.g. marking exams and quizzes, serving on committees, consulting other departments etc.) and suggest to create a strategic administrative function and/or to make more use of teaching assistants to alleviate the burden.

Criterion 4.3 Funds and equipment
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Evidence:

- Information about infrastructure on website:
http://forestaes.ujed.mx/es/acerca_infraestructura_galeria.php
- Tour during onsite visit

Preliminary assessment and analysis of the peers:

Sultan Quabos University is the only public state university of the country and disposes of sufficient funds and infrastructure to execute the two programs under review. Students and Staff in general were satisfied with the equipment and available resources as well as rooms. Concerning the level of technical equipment, the peers visited a number of computer labs, classroom facilities and the conference centre, which were according to expectations. In the very modern SQU library, the students have access to electronic scientific and educational resources and to the electronic library system, including current publications that are needed for study and research.

Male students, who are not living on the campus like their female counterparts, during the interviews were complaining about missing study areas and a lack of working places in the department. They mentioned that they sometimes would resort using the computer rooms as working spaces in the absence of other suitable rooms. During the tour onsite, the peers however reach the conclusion that there a plentiful working spaces e.g. in a very modern library, though not in the department. Students can use the campus bus to get there. Otherwise the students express their general satisfaction with the available resources and conditions of studying, thereby confirming the positive impression of the peer group.

The auditors conclude that in spite of the general cuts in funding due to the difficult economic situation in the Sultanate, there are sufficient funds available for the execution of the programs under review with one notable exception. Even in terms of shortage a budget should be provided to student bodies to finance their activities. The infrastructure complies with the requirements for sustaining the programs under review, the overall quality of the equipment is seen fit for purpose.

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

The peers commend the University's effort and assess criterion 4 as fulfilled.

Criterion 5.1 Module descriptions

Evidence:

- Course Handbook

Preliminary assessment and analysis of the peers:

As annex to the Self Assessment Report, the peers were provided with a very detailed course handbook. The course handbook is provided to the students and it is accessible on the website of the department.

In addition, each student is receiving at the outset of the semester a detailed weekly course outline concerning the topics and material to be covered for the entire 15 week semester span. The experts positively note, that there is now a uniform template to describe the course content in a homogenous way.

In spite of this extensive amount of information and after intensive study of its content and discussions with staff members the peers see room for improvement in a number of areas.

An upgrade of module descriptions must be effectuated, as in many courses important information such as the distribution between lectures and self-study/homework assignments is not clear. They also point to the fact that in many modules the indicated literature is outdated; in Foundations of Mathematics (MATH2350) and Abstract Algebra (MATH4453) e.g., the matrix of course objectives and outcomes is not completed. The book Applied Nonparametric Statistics appeared in 1990 and cannot cover recent development, e.g. on exact nonparametric tests. Often, while homework and exams are detailed in a module description, the correct tickmarks are not ticked on the first page of the module description.

Criterion 5.2 Diploma and Diploma Supplement

Evidence:

- Sample of degree certificate
- Transcript of records

Preliminary assessment and analysis of the peers:

In prior accreditation visits of ASIIN to other study programs, the absence of a Diploma supplement providing information about the student's qualifications profile, individual performance, classification of the degree programme within the educational system, grading system and statistical data on the final grade) etc. was critically noted.

On request, a sample of the Diploma Supplement for the programs under review has now been submitted. The peers expect and understand, that this DS is handed over to the graduates of both programs together with their certificate and the transcript of records on the occasion of their graduation. The graduates will thereby benefit from this standardized document because this way their academic qualification is more easily recognized abroad, the description of their academic career and the competencies acquired during their studies are included, and it offers them easier access to opportunities for work or further studies abroad.

Criterion 5.3 Relevant rules

Evidence:

- Rules and regulations published on website:
http://forestaes.ujed.mx/es/acerca_facultad_normatividad.php

Preliminary assessment and analysis of the peers:

The panel members positively acknowledge that all rules and regulations defining the rights and duties of university and students and governing the student life within the programme and the institution are clearly defined and binding. They are made publicly available on the website.

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

The University reports that most curriculum material, save for a very small portion for self-study, is covered in class. As such, no specific study hours are prescribed in the module handbook for the self-study materials as they cover only a small part of the entire syllabus and these hours are left to the students as part of their time management. The University appreciates the peers' observation that some of the literature mentioned in the module description is outdated and they are making efforts to ensure that all literature is up to date and that only modern literature will be utilized in class. Furthermore, the experts have suggested establishing a permanent Industry-Department relations committee. The peers

are pleased to hear that the two departments are already in the process of setting up advisory bodies with members drawn from both industry and government institutions which will be able to suggest improvements of the two study programmes with regards to the needs of future employers and the visibility of the departments.

The peers commend these future endeavours and assess criterion 5 as fulfilled.

6. Quality management: quality assessment and development

Criterion 6 Quality management: quality assessment and development

Evidence:

- Self-assessment report
- SQU Undergraduate Academic Regulations.
- Discussions during onsite visit

Preliminary assessment and analysis of the peers:

The peers acknowledge that a comprehensive quality assurance system is in place on the university as well as on the department level and commend SQU on this. According to the Vice-Chancellor for Academic Affairs, QA constitutes a priority for the institution, the department as well as the faculty.

As regards the programs under review, the multiple internal and external review patterns have already been described. There are a variety of different evaluation mechanisms: first, each program is reviewed every five years. This last happened in 2015/2016, the program will be offered in its current version until 2020. Alumni and students mention the need to modernize the program and update its content. This will remain a continuous challenge.

In addition, the programs monitor its performance by conducting a considerable number of surveys in terms of student's satisfaction including the teaching performance, overall satisfaction with the programmes and support services. The results of these surveys are aggregated each year in a report to the leadership. They also feed into the execution of a Strategic Development plan for the department and the program. Furthermore, there is a Staff-Student Liaison Committee, which meets once a semester to discuss the problems faced by students. Two problems, which the peers nevertheless encounter during the discussions, are related to the fact, that the pace of reform is frequently slow (the same suggestions are popping up without action being taken and frequently feedback loops are not

closed in the sense that stakeholder suggesting improvement or notifying problems are not informed about remedial action taken).

In the discussions with representatives of Alumni/Industry, the experts learn on the one hand that there are manifold ideas and suggestions for working together with the department and for improving the execution of the programs under review. Industry offers support in providing internships and student training, is interested in conducting joint research projects, is offering/in need of consultancy and could also be contacted to provide teaching services from the field. At the same time it also becomes clear, that there are no persistent and stable communication channels to discuss these proposals on a regular basis.

As regards external QA channels, the department has invited three international external examiners to review the programs and give their feedback on how to modernize teaching and research. These international peers have been visiting in the past three years for consulting purposes. Another external quality assessment on the institutional level is provided by the national Omani accreditation agency and now by the program review of ASIIN.

The panel acknowledges that considerable efforts are invested in all of these quality assurance instruments with acceptable return rates. Still, it sees room for improvement in the following areas:

In spite of the fact that enormous quantities of data are being assembled more efforts should be invested into delineating suitable corrective action patterns out of them. Feedback loops should be closed in the sense that those providing feedback for improvement should get a response concerning their observations and suggestions. The experts also suggest the establishment of a permanent Industry-Department relations committee, to stimulate further cooperation. This committee also could be used to start a marketing campaign for the Bachelor programs under review and to convince the market about the value especially of mathematics graduates and the program, which in the past was suffering from a negative perception internally as well as externally. Existing job fairs could also be used to promote internship opportunities and job prospects.

Finally, the strategic development plan as of now merits further refinement as key performance indicators, corresponding timetables and persons in charge need to be more clearly defined.

As the programme at this very moment about to undergo an extensive revision, it is a very good moment to implement these recommendations and modernize the internal QA instruments.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 6:

The peers emphasise the importance of quality management and assessment and see criterion 6 as fulfilled.

D Additional Documents

Before preparing their final assessment, the panel ask that the following missing or unclear information be provided together with the comment of the Higher Education Institution on the previous chapters of this report:

- Sample of Diploma Supplements in English for both study programmes
- Information regarding the Standard Period of Study, graduation and progression rates and the graduates' success on the labour market.
- University course descriptions in English.

E Comment of the Higher Education Institution

The institution provided a detailed statement as well as the following additional documents, which were requested by the peers:

- Sample of Diploma Supplements in English for both study programmes
- Information regarding the Standard Period of Study, graduation and progression rates and the graduates' success on the labour market.
- University course descriptions in English.

F Summary: Peer recommendations

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

Degree Programme	ASIIN seal	Subject-specific Label	Maximum duration of accreditation
Ba Mathematics	With requirements for one year	n/a	30.09.2024
Ba Statistics	With requirements for one year	n/a	30.09.2024

Requirements

For both study programs

- A 1. (ASIIN 1.1) The program learning outcomes and competence profiles of both programs must be adapted and made public to reflect more accurately existing and future job profiles.
- A 2. (ASIIN 2.2) A workload based credit system identifying the amount of self-study (separate from the already identified contact hours) needs to be designed and used for the further elaboration of the two programs under review and to support students to study in the Standard Period of Time.
- A 3. (ASIIN 3) The number of exams needs to be reduced. There must not be more than one midterm exam per course.

Recommendations

For both study programs

- E 1. (ASIIN 1.4) Further effort should be undertaken to make the Bachelor in Mathematics and Statistics more attractive.
- E 2. (ASIIN 1.4) The health statistics minor should also be opened for female students.
- E 3. (ASIIN 2.1.) It is recommended making internships a compulsory component
- E 4. (ASIIN 2.3) It is recommended reinforcing more interactive forms of student learning.

- E 5. (ASIIN 3) It is recommended reforming the structure and content of the exam system as described in the report (the quality of substantive independent homework assignments should be increased to develop critical thinking skills and analytical capabilities, more oral exams, using computer programs to distribute separate tasks).
- E 6. (ASIIN 3) To give students more time to prepare for their exams, the peers recommend establishing a reading week during the exam period, so that students do not have to visit any additional courses during this time.
- E 7. (ASIIN 4.1) The peers strongly recommend increasing the number of full professorships in the two departments and to have at least one full professor representing the statistics department.
- E 8. (ASIIN 4.2) Efforts should be reinforced to publish research output in the department in more prominent international journals.
- E 9. (ASIIN 4.3) Even in times of shortage of university funds, a budget should be provided to student bodies to finance their activities.
- E 10. (ASIIN 5.1) It is recommended upgrading the course descriptions by identifying the distribution between lectures and self-study for each course and to modernize the used literature.
- E 11. (ASIIN 6) It is recommended further improving the existing QA schemes along the recommendations provided in the report (creation of an industry-department relations committee, improving the graduates/alumni database and their success on the labour market, modernization of the Strategic Plan for the department by including more stringent KPI's, deadline and persons in charge, closing feedback loops with stakeholders etc.).

For the Bachelor's program Mathematics

- E 12. (ASIIN 2.1) It is strongly recommended to separate the mathematics courses for mathematicians from the mathematics courses for users from other departments as early as possible e.g. by swapping "Real Analysis" with "Calculus III" and to teach the basic theories by giving rigorous proofs of all essential theorems.

For the Bachelor's program Statistics

- E 13. (ASIIN 1.4) It is recommended basing the admission politics on merit and not on gender requirements.
- E 14. (ASIIN 2.1) It is recommended introducing more active teaching in data analysis with statistical software (including R) and to use actual statistical data for a more hands-on approach to data analysis.
- E 15. (ASIIN 2.1) In the Health Statistics minor, the analysis of censored data is indispensable and must as such be raised continuously.

G Comment of the Technical Committee 12 - Mathematics (23.11.2018)

Assessment and analysis for the award of the ASIIN seal:

The Technical Committee discusses the procedure. It agrees overall with the resolution recommended by the peer panel. Yet, they convert the recommendation to separate the mathematics courses for mathematicians from the mathematics courses for users from other departments into a requirements to secure the quality of the courses. The Technical Committee also changes the wording in requirement A1 to emphasize the distinction between the first and the second part of the requirement. Furthermore, it files the recommendation regarding the health statistics minor under “Recommendations for the Bachelor program Statistics”, where it rightfully belongs.

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

Degree Programme	ASIIN-seal	Subject-specific label	Maximum duration of accreditation
Ba Mathematics	With requirements for one year	n/a	30.09.2024
Ba Statistics	With requirements for one year	n/a	30.09.2024

Requirements

For both study programs

- A 1. (ASIIN 1.1) The program learning outcomes and competence profiles of both programs must be adapted and more over made public to reflect more accurately existing and future job profiles.
- A 2. (ASIIN 2.2) A workload based credit system identifying the amount of self-study (separate from the already identified contact hours) needs to be designed and used for the further elaboration of the two programs under review and to support students to study in the Standard Period of Time.
- A 3. (ASIIN 3) The number of exams needs to be reduced. There must not be more than one midterm exam per course.

For the Bachelor's program Mathematic

- A 4.** (ASIIN 2.1) It is strongly recommended to separate the mathematics courses for mathematicians from the mathematics courses for users from other departments as early as possible e.g. by swapping "Real Analysis" with "Calculus III" and to teach the basic theories by giving rigorous proofs of all essential theorems.

Recommendations

For both study programs

- E 1. (ASIIN 1.4) Further effort should be undertaken to make the Bachelor in Mathematics and Statistics more attractive.
- E 2. (ASIIN 2.1.) It is recommended making internships a compulsory component
- E 3. (ASIIN 2.3) It is recommended reinforcing more interactive forms of student learning.
- E 4. (ASIIN 3) It is recommended reforming the structure and content of the exam system as described in the report (the quality of substantive independent homework assignments should be increased to develop critical thinking skills and analytical capabilities, more oral exams, using computer programs to distribute separate tasks).
- E 5. (ASIIN 3) To give students more time to prepare for their exams, the peers recommend establishing a reading week during the exam period, so that students do not have to visit any additional courses during this time.
- E 6. (ASIIN 4.1) The peers strongly recommend increasing the number of full professorships in the two departments and to have at least one full professor representing the statistics department.
- E 7. (ASIIN 4.2) Efforts should be reinforced to publish research output in the department in more prominent international journals.
- E 8. (ASIIN 4.3) Even in times of shortage of university funds, a budget should be provided to student bodies to finance their activities.
- E 9. (ASIIN 5.1) It is recommended upgrading the course descriptions by identifying the distribution between lectures and self-study for each course and to modernize the used literature.
- E 10. (ASIIN 6) It is recommended further improving the existing QA schemes along the recommendations provided in the report (creation of an industry-department relations committee, improving the graduates/alumni database and their success on the labour market, modernization of the Strategic Plan for the department by

including more stringent KPI's, deadline and persons in charge, closing feedback loops with stakeholders etc.).

For the Bachelor's program Statistics

- E 11. (ASIIN 1.4) It is recommended basing the admission politics on merit and not on gender requirements.
- E 12. (ASIIN 1.4) The health statistics minor should also be opened for female students. (Diese Empfehlung betrifft nur den Ba Statistics)
- E 13. (ASIIN 2.1) It is recommended introducing more active teaching in data analysis with statistical software (including R) and to use actual statistical data for a more hands-on approach to data analysis.
- E 14. (ASIIN 2.1) In the Health Statistics minor, the analysis of censored data is indispensable and must as such be raised continuously.

H Decision of the Accreditation Commission (07.12.2018)

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

The Accreditation Committee discusses the procedure and generally agrees with the peers' assessment and the recommendations made by the Technical Committee.

The Accreditation Commission for Degree Programmes decides to award the following seals:

Degree Programme	ASIIN-seal	Subject-specific label	Maximum duration of accreditation
Ba Mathematics	With requirements for one year	n/a	30.09.2024
Ba Statistics	With requirements for one year	n/a	30.09.2024

Requirements

For both study programs

- A 1. (ASIIN 1.1) The program learning outcomes and competence profiles of both programs must be adapted and more over made public to reflect more accurately existing and future job profiles.
- A 2. (ASIIN 2.2) A workload based credit system identifying the amount of self-study (separate from the already identified contact hours) needs to be designed and used for the further elaboration of the two programs under review and to support students to study in the Standard Period of Time.
- A 3. (ASIIN 3) The number of exams needs to be reduced. There must not be more than one midterm exam per course.

For the Bachelor's program Mathematic

- A 4. (ASIIN 2.1) The mathematics courses for mathematicians must be separated from the mathematics courses for users from other departments as early as possible

the basic theories must be taught by giving rigorous proofs of all essential theorems.

Recommendations

For both study programs

- E 1. (ASIIN 1.4) Further effort should be undertaken to make the Bachelor in Mathematics and Statistics more attractive.
- E 2. (Jetzt unter "Bachelor Programme Statistics") (ASIIN 1.4) The health statistics minor should also be opened for female students.
- E 3. (ASIIN 2.1.) It is recommended making internships a compulsory component
- E 4. (ASIIN 2.3) It is recommended reinforcing more interactive forms of student learning.
- E 5. (ASIIN 3) It is recommended reforming the structure and content of the exam system as described in the report (the quality of substantive independent homework assignments should be increased to develop critical thinking skills and analytical capabilities, more oral exams, using computer programs to distribute separate tasks).
- E 6. (ASIIN 3) To give students more time to prepare for their exams, the peers recommend establishing a reading week during the exam period, so that students do not have to visit any additional courses during this time.
- E 7. (ASIIN 4.1) The peers strongly recommend increasing the number of full professorships in the two departments and to have at least one full professor representing the statistics department.
- E 8. (ASIIN 4.2) Efforts should be reinforced to publish research output in the department in more prominent international journals.
- E 9. (ASIIN 4.3) Even in times of shortage of university funds, a budget should be provided to student bodies to finance their activities.
- E 10. (ASIIN 5.1) It is recommended upgrading the course descriptions by identifying the distribution between lectures and self-study for each course and to modernize the used literature.
- E 11. (ASIIN 6) It is recommended further improving the existing QA schemes along the recommendations provided in the report (creation of an industry-department relations committee, improving the graduates/alumni database and their success on the labour market, modernization of the Strategic Plan for the department by

including more stringent KPI's, deadline and persons in charge, closing feedback loops with stakeholders etc.).

For the Bachelor's program Statistics

- E 13. (ASIIN 1.4) It is recommended basing the admission politics on merit and not on gender requirements.
- E 14. (Ehemals unter "For all Study Programmes") (ASIIN 1.4) The health statistics minor should also be opened for female students. (Diese Empfehlung betrifft nur den Ba Statistics)
- E 15. (ASIIN 2.1) It is recommended introducing more active teaching in data analysis with statistical software (including R) and to use actual statistical data for a more hands-on approach to data analysis.
- E 16. (ASIIN 2.1) In the Health Statistics minor, the analysis of censored data is indispensable and must as such be raised continuously.

Fulfilment of Requirements (26.06.2020)

Analysis of the peers and the Technical Committee (04.06.2020)

Requirements

For all degree programmes

- A 1. (ASIIN 1.1) The program learning outcomes and competence profiles of both programs must be adapted and more over made public to reflect more accurately existing and future job profiles.

Initial Treatment	
Peers	not (completely) fulfilled Justification: While the learning outcomes have been published on the SQU website, it remains unclear where and how students may inform themselves about <i>professional perspectives</i> . Although SQU has communicated information regarding existing and future job profiles to ASIIN, those information should also be made available to the students.
TC 12	Fulfilled Vote: unanimous Justification: The technical committee is satisfied with the current programme learning outcomes and competence profiles of the degree programmes. They see no further need for an elaboration on the professional perspectives, especially since the Omani labour market is in a state of transformation thus an even clearer career profile for degree programmes as diverse as Mathematics and Statistics would rather hinder the employment of the alumni.

- A 2. (ASIIN 2.2) A workload based credit system identifying the amount of self-study (separate from the already identified contact hours) needs to be designed and used for the further elaboration of the two programs under review and to support students to study in the Standard Period of Time.

Initial Treatment	
Peers	fulfilled Justification: A workload based credit system identifying the amount of self-study has been designed.
TC 12	fulfilled Vote: unanimous

	Justification: The technical committee agrees with the assessment of the peers.
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- A 3. (ASIIN 3) the number of exams needs to be reduced. There must not be more than one midterm exam per course.

Initial Treatment	
Peers	fulfilled Justification: The number of exams has been reduced so that there is not more than one midterm exam per course.
TC 12	fulfilled Vote: unanimous Justification: The technical committee agrees with the assessment of the peers.

For the Bachelor's programme Mathematics

- A 4. (ASIIN 2.1) The mathematics courses for mathematicians must be separated from the mathematics courses for users from other departments as early as possible the basic theories must be taught by giving rigorous proofs of all essential theorems

Initial Treatment	
Peers	not (completely) fulfilled Justification: Two modules (Calculus II and Linear Algebra I) have been separated from the service modules and do include proofs now. In addition, SQU has also created two new modules (Advanced Calculus and Introduction to Metric Spaces) as well as re-designed some other courses to include more proofs and theorems. Yet, now <i>all essential theorems</i> are proven as some are still missing.
TC 12	Fulfilled Vote: unanimous Justification: Two modules (Calculus II and Linear Algebra I) have been separated from the service modules and do include proofs now. In addition, SQU created two new modules (Advanced Calculus and Introduction to Metric Spaces) plus they re-designed Foundations of Mathematics, Linear Algebra II and Real Analysis I. Many theoretical concepts of mathematics are thus covered in these new and extended courses. Thus, SQU has surpassed what

Decision of the Accreditation Commission (26.04.2020)

Degree programme	ASIIN-label	Subject-specific label	Accreditation until max.
Ba Mathematics	All requirements fulfilled	/	30.09.2024
Ma Statistics	All requirements fulfilled	/	30.09.2024