ASIIN Seal

Accreditation Report

Bachelor's Degree Programmes
Mathematics
Operation Research
Physics
Statistics

Male campus

Provided by
King Saud University, Riyadh, Saudi Arabia

Version: 23 March 2018

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]
Bachelor of Science in Mathematics		ASIIN	01.04.2011 – 30.09.2016	TC 12
Bachelor of Science in Operations Research		ASIIN	01.04.2011 – 30.09.2016	TC 12/13
Bachelor of Science in Physics		ASIIN	01.04.2011 – 30.09.2016	TC 13
Bachelor of Science in Statistics		ASIIN	01.04.2011 – 30.09.2016	TC 12
Date of the contract: 09.05.2017 **Submission of the final version of the self-assessment report:** 07.06.2017 **Date of the onsite visit:** 13-15 November 2017 **at:** Male campus, Main Campus (Dir'iya), College of Science, Building Number: 4 – 5, King Saud University, Riyadh, 11451 Saudi Arabia.				
Peer panel: Prof. Dr. Mathias Getzlaff, Heinrich-Heine-Universität Düsseldorf; Prof. Dr. Norbert Kalus, Beuth Hochschule für Technik, University of Applied Sciences Berlin; Dr. Juan Carlos Matutat, Daimler AG;				

[1] ASIIN Seal for degree programmes

[2] TC: Technical Committee for the following subject areas: TC 12 - Mathematics; TC 13 - Physics.

Prof. Dr. Gabriel Wittum, King Abdullah University of Science and Technology.	
Representative of the ASIIN headquarter: Dr. Thomas Lichtenberg	
Responsible decision-making committee: Accreditation Commission for Degree Programmes	
Criteria used: European Standards and Guidelines as of May 2015 ASIIN General Criteria, as of 01.12.2015 Subject-Specific Criteria of Technical Committee 12 – Mathematics as of 09.12.2011 Subject-Specific Criteria of Technical Committee 13 – Physics as of 09.12.2011	

B Characteristics of the Degree Programmes

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.	n/a	6	Full	n/a	8 Semesters	136 credits	1957, intake annually
Physics	B.Sc.	n/a	6	Full	n/a	8 Semesters	136 credits	1957, intake annually
Operations Research	B.Sc.	n/a	6	Full	n/a	8 Semesters	136 credits	1979, intake annually
Statistics	B.Sc.	n/a	6	Full	n/a	8 Semesters	136 credits	1978, intake annually

For the Bachelor's degree programme Mathematics the institution has presented the following profile in the Programme Specifications:

"Program Mission Statement

Offering excellent programs aimed at graduating students in all degrees in the field of Mathematics and its applications capable of meeting the developmental needs of society, as well as enriching knowledge through education, research, authoring and translation."

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

For the Bachelor's degree programme Operation Research the institution has presented the following profile in the Programme Specifications:

"Program Mission Statement

Commitment to excellence in discovery and transmission of knowledge in the field of Operation research, achieving international recognition and satisfying the national needs of skilled manpower. Providing nurturing and conductive environment for quality teaching, learning and research in basic and Applied Operation research."

For the Bachelor's degree programme Physics the institution has presented the following profile in the Programme Specifications:

"Program Mission Statement

Offer highly distinguished education and creative research to serve society and contribute toward knowledge through creating a stimulating educational, creative and scientific research environment of continued quality that guarantee the use of technology and general partnership with the social institutions in connection to the disciplines of Physics and Astronomy."

For the Bachelor's degree programme Statistics the institution has presented the following profile in the Programme Specifications:

"Program Mission Statement

To fulfill the needs of society in the fields of statistics by providing quality and effective educational programs to achieve the ambitions of the development plans of the society, with continued efforts at improving these programs and maintaining the quality of scientific research."

C Peer Report for the ASIIN Seal[4]

1. The Degree Programme: Concept, content & implementation

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

Evidence:

- Programme Specifications, including Program Learning Outcome Mapping Matrix
- Self-Assessment Reports Mathematics, Physics, Operations Research, Statistics
- Subject specific website:
    - Mathematics: https://sciences.ksu.edu.sa/en/node/649 (accessed 01.12.2017);
    - Vision Mathematics: https://sciences.ksu.edu.sa/en/node/619 (accessed 01.12.2017)
    - Physics: https://sciences.ksu.edu.sa/en/node/2034 (accessed 01.12.2017)
- Mission Statements:
    - Operations Research: https://sciences.ksu.edu.sa/en/node/4217 (accessed 01.12.2017)
    - Statistics: https://sciences.ksu.edu.sa/en/node/4216 (accessed 01.12.2017)
- Discussions with management and teaching staff during onsite visit

Preliminary assessment and analysis of the peers:

*Objectives and learning outcomes of the degree programme*s

The peers welcome the English subject-specific websites for all degree programs under scrutiny. They can see that much programme-relevant information is provided on the respective websites; however, the structure of the websites and the content as well as the

[4] This part of the report applies also for the assessment for the European subject-specific labels. After the conclusion of the procedure, the stated requirements and/or recommendations and the deadlines are equally valid for the ASIIN seal as well as for the sought subject-specific label.

amount of information provided differs strongly from program to program. The peers recommend to structure all websites in a coherent manner and to make all programme related information (including learning outcomes and programme specifications) available on one site.

The programme specifications for each of the programmes contain both objectives for the department offering them as well as for the students. The auditors appreciate the strategic specifications for the department, but for this accreditation process, the panel focused on the programme objectives while acknowledging that the overarching mission and objectives of the department also served as framework for the programme development, e.g. in the aim of "producing qualified graduates" or to "attract mathematically talented candidates to prepare them for faculty positions". The learning outcomes for the students were found to be aligned with the National Qualifications Framework (NQF) of Saudi Arabia as stipulated by the National Commission for Academic Accreditation & Assessment. The panel positively noted that all modules were linked to the NQF as well as to corresponding teaching and assessment methods.

The peers refer to the **Subject-Specific Criteria (SSC)** of the Technical Committee Mathematics and Physics as a basis for judging whether the intended learning outcomes of the four Bachelor's programmes, as defined by KSU, correspond to the exemplary constituted learning outcomes of these Technical Committees. The auditors examine the areas of competence as set forth by the Subject-Specific Criteria for degree programmes and come to the following conclusions:

Based on the Subject-Specific Criteria of Mathematics, a bachelor's programme needs to cover specialist, subject-related and social competences. The graduates of the Bachelor of Mathematics of KSU shall be able to "recall definitions of basic mathematical terms", "state some fundamental mathematical theorems" and to "describe methods of proof". In addition the students shall also "describe mathematical techniques used for solving of applied problems". The peers can see that this is in line with the subject-specific criteria of ASIIN and that graduates of KSU shall "have sound mathematical knowledge" and be able to "recognize and solve mathematics-related problems". The programme specifications provided by KSU also intend to enable the students to "select and apply appropriate mathematical method needed for the solution of a problem". The students shall also obtain interpersonal skills which comprises the competence to "work independently and in teams" and to "meet deadlines and manage time properly". The auditors appreciate that students shall also "exhibit ethical behaviour and respect different points of view". Finally, students shall develop communication and Information Technology skills like "to present mathematics to others, both in oral and written form clearly and in a well-organized manner", "to use IT facilities

as an aid to mathematical processes" and to "use the library to locate mathematical information".

The Bachelor of Operation Research includes intended learning outcomes in the field of knowledge to "identify the concept of convex analysis and its influences on OR problems", to "recognize linear and nonlinear optimality and their roles in solving problems" and to "recognize theories and methods applied to for interpreting and analyzing data related to OR". In addition, students shall develop cognitive skills that enable them to "differentiate between theories of OR theories and principles and then assess their concepts and principles", "to interpret quantitative and qualitative data based on OR and statistical analysis" and to "analyze, assess and interpret qualitatively and quantitatively relevant data". Students shall also obtain the competence to "postulate, build up and deduce OR mechanisms and procedures that can be used to handle scientific problems". Apart from the subject-related competences the students shall also be introduced to interpersonal skills like "work in teams in order to plan, execute, report and present OR based projects" or develop the "ability to learn independently using a variety of media, including electronic media". The peers understand that communicational skills are also aimed at, because students shall be able to "communicate OR clear and concise manner appropriate to the context" and they shall develop the "ability to present results OR analyses through written and oral presentations".

The learning outcomes for the Bachelor of Physics describe skills in the field of knowledge like students shall be able to "define the most fundamental concepts, principles and terminology of physics" and to "recognize appropriate tools and techniques that may be used to solve the problems they will face". Cognitive skills like to "apply the knowledge and understanding to solve qualitative and quantitative problems of a familiar and unfamiliar nature" and to "execute and analyze critically the results of an experimental investigation and draw valid conclusions" shall also be achieved. Like in the other programmes, students shall also develop interpersonal skills such as "to learn independently", "to work as a team", "to acknowledge others' work", and to "be self-disciplined". These skills are complemented by communicational skills like "research in web sites" or "calculate and interpret the results using computer programs". In Physics, it is also important that students develop psychological and motor skills like to "operate and use equipment/tools/machinery appropriately" and to "take precise and accurate measurements".

The Bachelor of Statistics also describes learning outcomes in the field of knowledge, including that graduates shall be able to "identify the concepts and basic knowledge of specialization and its relationship to other disciplines" and they shall obtain "knowledge of theories and scientific facts in the sections of Statistics and interrelations among organisms

and their biosphere". It is worthwhile mentioning that this programme intends for its graduates to "learn computer skills, software, statistical Packages and applications" and students shall develop "knowledge of the concepts of laboratory management, organization and evaluation." The cognitive skills of this programme aim to ensure that students have "knowledge of the methods of scientific research and the ability to design and evaluation of scientific research." The interpersonal skills in this programme cover a wide range of competences like the ability to "work in groups", to "act as coordinator between members of the team" but also to "work as team leader" and "present scientific problems depending on the type of data". Finally, the students shall also be able to "interact and deal with the various academic, student activities". With regard to the communication skills, the graduates shall be able to "use computer and entry and use of databases". They shall know how to obtain "access and use information networks" and "use of audiovisual devices". Finally, the students shall develop "verbal, written and electronic communication skills".

The peers conclude that the Subject-Specific Criteria of Mathematics and Physics are by and large covered in the learning objectives of all four degree programmes under review.

Employment opportunities for graduates

Based on the discussion with staff members and teachers, most graduates find an adequate occupation easily after graduation, but some of them not exactly in their preferred field. The peers appreciate the efforts of KSU to undertake regular surveys of alumni as well as of employers to get some firsthand feedback on the quality of education provided by KSU. According to the teachers and also the business representatives, especially the fields of statistics and operation research are a growing market and due to the fact that Saudi Arabia strives to obtain more accurate statistical data, the governmental statistical institutions are rapidly growing. However, especially in the field of statistics the business partners are not fully satisfied with the competences of the graduates; the same applies to mathematics to some extent, where business partners indicate that they are not fully satisfied with the competences of the graduates. In Physics, the business partners stress that the graduates are very well educated and better prepared for the job than graduates from other universities; they underline that graduates from KSU can easily adopt to the requirements of the specific working environment. In summary, the peers comprehend that most students find an occupation in a reasonable time but not all of them in field of their profession. In addition, in some of the programmes under review the business partners highlight that the graduates are not fully prepared for the job and would require additional competences (compare criterion 1.3)

Further development of degree programmes

The peers understand that the College of Science and the Department of Mathematics have established advisory committees which are a selected group of representatives from industry, government agencies, academia, private sector, and the profession who advise the College of Science and its departments on academic issues and on current trends and future directions in science. There are Study Plan Committees of the different programmes in place; the study plans and curricula are revised every 5 years. The recommendations of the committee, which takes into consideration the comments of the students and the employers as well as those of the teaching staff, are discussed in the Departmental Council to formulate and approve any changes in the study plan. Then a recommendation with the proposed changes is forwarded to the Vice dean of academic affairs to complete the approval procedures in the College and then in the University. From a formal point of view, the peers agree that the involvement of the stakeholders in the development of the programmes is considered adequately. However, during the onsite visit the peers gained the impression that the communication between KSU staff members and business partners was not fully satisfactory to all partners. The discussion partners agreed that more systematic exchange could be organized (compare criterion 6).

Criterion 1.2 Name of the degree programme

Evidence:

- Programme Specifications, including Program Learning Outcome Mapping Matrix
- Self-Assessment Reports Mathematics, Physics, Operations Research, Statistics

Preliminary assessment and analysis of the peers:

The panel considered the names of all four programmes to fully reflect their objectives and content and thus to be entirely adequate. The issue of the teaching language is taken up elsewhere in this report (criterion 1.3).

Criterion 1.3 Curriculum

Evidence:

- Programme Specifications, including Program Learning Outcome Mapping Matrix
- Self-Assessment Reports Mathematics, Physics, Operations Research, Statistics
- Subject specific website:
    - Mathematics: https://sciences.ksu.edu.sa/en/node/649 (accessed 01.12.2017);

  - Vision Mathematics: https://sciences.ksu.edu.sa/en/node/619 (accessed 01.12.2017)
  - Physics: https://sciences.ksu.edu.sa/en/node/2034 (accessed 01.12.2017)
- Mission Statements:
  - Operations Research: https://sciences.ksu.edu.sa/en/node/4217 (accessed 01.12.2017)
  - Statistics: https://sciences.ksu.edu.sa/en/node/4216 (accessed 01.12.2017)
- Study plans on website: http://sciences.ksu.edu.sa/en/node/1101 (accessed 01.12.2017)
- Discussions with management and teaching staff during onsite visit

Preliminary assessment and analysis of the peers:
The peers see that English classes are only taught in the first year. In the following semesters some modules are also in English; however, it turns out that even those classes that are supposed to take place in English hardly practice English. The literature provided is in English but according to the students and to the teachers, most of the conversation takes place in Arabic. One of the peers had been part of the panel during the first accreditation and confirms that the overall English communication competence has slightly improved. But still most of the students had difficulties to comprehend the English conversation, let alone were able to express themselves. The students also expressed their interest particularly in technical English as they find it challenging to understand scientific literature. In addition, in Mathematics not a single final bachelor thesis that had been presented to the peers had been written in English. Many students indicate their interest to participate in international exchanges but see the lack of language competences as the primary barrier. In the first accreditation it had been recommended to foster the overall English competences in the light of KSU's ambition to become more international. The panel concurs with the students, that the mix of languages proved confusing and does not sufficiently contribute to the aim of generating English skills in the subject. They considered it advisable to encourage students with lower English competences to take up additional English classes which are already offered outside of the curriculum. A more persistent approach to the teaching language, including technical terminology, would also enable students to participate more easily in international mobility activities as was desired by all stakeholders.

The panel highly welcomed that recommendations from the previous accreditation regarding improvements to the curricula had been implemented, specifically with regard to introducing a mandatory course in programming. The new course (CSC111) was found to be

adequate to ensure that all students gain numeric knowledge, using mainly Java and C++. Students also confirm that they learn the usage of MATLAB.

As outlined under criterion 1.1, the auditors could see that the intended learning outcomes are in line with the Subject-Specific Criteria (SSC) of the Technical Committees Mathematics and Physics. The peers base their assessment whether the curricula of the different degree programmes are suitable to achieve the intended learning outcomes on the module descriptions and the study plans which are published on the website. The overall objectives and intended learning outcomes for the degree programme are systematically substantiated in modules and it is clear for the peers which knowledge, skills and competences students will acquire in each module.

The peers understand that the students have to chose 8 credit points out of a list of University-wide elective course courses like “Introduction to Islamic Culture”, “Economic System in Islam”, “Studies in the Biography of the Prophet”, “Human Rights” etc. The peers looked at a number of examples of module descriptions and gained the impression that the modules deal with cultural topics of the Islam which does not contradict the basic principles of scientific research.

When analysing the curriculum of the Ba Mathematics the peers can see that sound mathematical knowledge can be obtained. They also conclude that the modules offered enable students to gain a profound overview of the contents of fundamental mathematical disciplines and they are able to identify their correlations in the field of mathematics. The students can chose 7 hours of electives to specialize in a field of interest. The peers understand that a bachelor programme needs to focus on basic competences and therefore the number of credits for electives is reasonable. However, the auditors think that the electives should be more open to the orientation of the Department and also include topics like e.g. computational science. The peers recommend to allow students to chose electives more widely in order to foster interdisciplinary work. The study plan shows lectures, exercises and practical courses. In mathematics the practical skills are taught in the modules “Computer Skills”, “Programming”, “General Physics”, and the “Research Project”. The peers welcome the new course CSC 111 dealing with different programming languages; however, given the number of different programming languages the students have to deal with the peers gain the impression that none of these languages can be taught in depth but all of them remain on a more superficial level. The lecturers explained that the students shall obtain an overview and a general understanding which can be built upon. The business representatives mentioned during the onsite discussion that the students have too little computer skills. The peers underline that programming skills are developed through repeated application and advise to exercise and apply programming skills throughout the study programme like it is done in the Ba Physics. But in summary, the business partners

confirm that the graduates from KSU have a good level of scientific qualification which can be used in industry. Some other partners complain that the graduates are not prepared for teaching.

The curriculum of the Ba Operation Research shows that the students shall acquire a profound overview of the contents of fundamental mathematical disciplines. The peers agree that it is important that students learn to employ techniques from other mathematical sciences, such as mathematical modeling, statistical analysis, and mathematical optimization to develop solutions. Because of its emphasis on human-technology interaction and because of its focus on practical applications the peers welcome the interdisciplinary approach and also modules like "Decision and Game Theory" which introduces very specific aspects of Operation Research into this programme. The peers also acknowledge that the curriculum encompasses a wide range of problem-solving techniques and methods applied in the pursuit of improved decision-making and efficiency. The business representatives also praise that simulation competences are being taught. The students complain that from their point of view the curriculum contains too much statistics and too little operation research but the peers think that the curriculum is acceptable as it is.

The peers confirm that the Ba Physics programme provides a sound knowledge of classical physics (mechanics, electrodynamics, thermo-dynamics, vibrations, waves and optics). The laboratory equipment particularly for the basic experiments is still functioning but it is very old and needs to be renewed in the medium term (compare criterion 4.3). "Mathematical Physics" is included in the curriculum but the students request that even more mathematics and also more programming should be offered. The peers welcome the introduction of programming skills and think that it focuses on the right programming language and that it is followed up throughout the study programme so that the basic programming skills are deepened and further developed in the course of the study programme. Like in the Ba Mathematics the peers can see that elective courses are offered but they think that the students should be able to select from a wider range of electives including higher as well as applied mathematics to broaden the scope of the degree programme. The business partners underline that they are content with the subjects being taught as they are providing the necessary skills. Also the quality of the infrastructure is positively noted and it is asked if "open labs" might be offered to give the students more opportunities to do something voluntary.

The curriculum of the Ba Statistics also contains a profound introduction to fundamental mathematical disciplines and mathematics-related problems. The peers can also comprehend that the students learn to apply mathematical methods to statistical areas and are able to transfer the findings obtained to other component areas or applications. However, even though the students also obtain "Computer Programming" skills the business partners

complain that the taught programming language is not being used in industry. SPSS, for example, is being used in all companies and should be introduced more vigorously. The peers can understand the request of industry but underline that licenses of SPSS need to be bought and renewed regularly whereas R is a freeware and enables the students to write their own programmes. The business partners also report about students who had worked at their institution and who had shown a severe lack of practical skills (compare in more detail criterion 2.1). The peers agree that the practical skills need to be improved in this degree programme.

The peers conclude that the curriculum of the four bachelor programmes still have some weaknesses that need to be improved but by and large are designed in a way to develop the competences as exemplified in the Subject-Specific Criteria of ASIIN and the level 6 competences of the European Qualification Framework.

Criterion 1.4 Admission requirements

Evidence:

- Self-Assessment Reports Mathematics, Physics, Operations Research, Statistics
- Programme Handbooks
- Report on Programme Requirements and Regulations
- Website:
    - http://sciences.ksu.edu.sa/sites/sciences.ksu.edu.sa/files/imce_images/admission.pdf (accessed 01.12.2017)
    - http://sciences.ksu.edu.sa/en/node/2248 (accessed 01.12.2017)
- Discussions with management, teaching staff and students

Preliminary assessment and analysis of the peers:
The admission requirements for the programmes are made transparent in the programme handbooks as well as on the university website. Student surveys confirmed that the admission requirements and process were transparent. Generally, in line with national regulations, a secondary school certificate granting access to higher education is mandatory. The peers understand that all students who enter the College of Science need to conduct a preparatory year to ascertain that all students have obtained basic skills before they can study the professional degree programme. After the Preparatory Year, an additional acceptance grade is defined to be able to continue on to the second year. The necessary *grade*

point average (GPA) levels for different degree programmes differ. The students can indicate three wishes which programme they actually want to study and depending on the GPA they are allocated to the different programmes. The programme coordinators highlighted that most students are interested in subjects like medicine or engineering sciences; Mathematics or Statistics are apparently less attractive for students. Consequently, those students with a low GPA are primarily allocated to Mathematics. The students confirmed that most of them had not selected Mathematics as their primary choice. Staff and students pointed out that the overall qualification level, not least in English, of the students in this programme was lower and that these students regularly had a lack of interest in the subjects, causing longer duration of study and partly low quality of final theses (compare criterion 3). The panel gained the impression that the institution was well aware of the issue and the programme coordinators had proposed raising the required GPA level to attract more qualified students. However, this suggestion had been rejected. The auditors highlight that Mathematics is a demanding programme and applicants need to meet minimum standards of mathematical competences to be able to complete the study programme timely and at an adequate scientific level. This is particularly relevant with regard to the quality of the bachelor theses (compare criterion 3).

In summary, the auditors confirm that the requirements and procedures for admission are transparent and clear. All applicants are treated according to the same standards and regulations. For the Ba Mathematics admission requirements need to be introduced that support the students to achieve the learning outcomes.

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

As the university relinquished to give any comments, the auditors confirmed their preliminary assessments. They saw the criterion widely fulfilled. Nevertheless, it is necessary in all programmes to draft the educational objectives/learning outcomes so that they describe the academic, subject-specific and professional classification of the qualifications gained in the degree programmes.

Additionally the panel recommended for all programmes further developing the (technical) English competences of the students to enable them to participate in international mobility and applying more participatory educational methods to support the students achieving the intended learning outcomes. Further on they recommended for the bachelor's degree programmes in mathematics and physics to allow students to choose electives more widely in order to foster interdisciplinary working.

2. The degree programme: structures, methods and implementation

Criterion 2.1 Structure and modules

Evidence:

- Self-Assessment Reports Mathematics, Physics, Operations Research, Statistics
- Study plans on website: http://sciences.ksu.edu.sa/en/node/1101 (accessed 01.12.2017)
- Programme Handbook, including transfer regulations
- Discussions with management and teaching staff during onsite visit

Preliminary assessment and analysis of the peers:
Modularization:

All study programmes under review are modularized. The peers determine that each module is a sum of teaching and learning whose contents are concerted. Most of the modules of the Bachelor's degree programmes encompass between 2 and 8 credit points. The structure of the programme as well as the individual modules was found to be coherent and consistent. The results from satisfaction surveys from students and teaching staff also did not show any area of concern with regard to the structure or possible overlap. The embedding of electives into the curriculum has been discussed above (criterion 1.3).

Depending on the GPA achieved by students, these are allowed to take courses for a maximum of 20 contact hours per week. In case the GPA drops, students are asked to take fewer courses in order to achieve the intended competences. The panel considered this practice adequate though it might lead to slightly longer study durations. Overall, they found that most students completed their programme within 4 to 5 years.

Practical Approach/Internships

Currently no work placements or internships are foreseen in the curricula of the different degree programmes. The peers think that this is acceptable for the Ba Mathematics and Ba Physics, the bachelor programmes Ba Statistics and Ba Operation Research are more applied study programmes and therefore the students need exposure to a practical working environment. The business partners pointed out during the discussion that they gained the impression that students from the Ba Statistics as well as from the Ba Operation Research were educated too theoretical and are not prepared for the practical demands of the labour market. Some students indicated that they had carried out internship voluntarily and

judge these experiences as highly beneficial. The peers agree that study programmes with a more applied orientation like Statistics and Operation Research need to have compulsory practical components in the curriculum to make the graduates fit for the job. The auditors recommend introducing compulsory internships for these two programmes to enhance the practical skills and employability of graduates.

Student mobility

International mobility is organized on an institutional level and currently takes place in the form of summer schools at international universities or research centres. KSU highlights that international mobility is particularly emphasised in the Master's and PhD programmes where the second supervisor needs to come from a foreign university and parts of the programme need to be carried out at an international partner university. Some of the students indicate that they were interested to participate in international mobility but they feel that the lack of English language competences is the greatest barrier. The peers take note of this and stress their recommendation that KSU should further develop the (technical) English competences of the students to enable them to participate in international mobility (compare criterion 1.3).

Recognition of achievements and competences

The recognition of achievements and competences obtained at another university or outside the tertiary education sector is governed by the university regulations. The panel understands that a transfer from another university is very rare. In such cases, the procedures for checking the courses and competences are followed. However, it does not become fully clear if KSU is required to provide the reasons for the rejection of applications of recognition which would be necessary to be in accordance with the Lisbon Recognition Convention; the peers ask KSU to clarify this issue.

Criterion 2.2 Work load and credits

Evidence:

- Self-Assessment Reports Mathematics, Physics, Operations Research, Statistics
- Course Specifications
    - Ba Mathematics: https://sciences.ksu.edu.sa/en/node/4000 (accessed 01.12.2017)
    - Ba Operation Research: https://sciences.ksu.edu.sa/sites/sciences.ksu.edu.sa/files/imce_images/stat_en_plan2.pdf (accessed 01.12.2017)

  - Ba Physics: http://sciences.ksu.edu.sa/en/node/2034 (accessed 01.12.2017)
  - Ba Statistics: http://sciences.ksu.edu.sa/sites/sciences.ksu.edu.sa/files/imce_images/stat_en_plan2.pdf (accessed 01.12.2017)
- Study plans on website: http://sciences.ksu.edu.sa/en/node/1101 (accessed 01.12.2017)
- Self-Study Reports including progression statistics, survey results
- Discussions with management, teaching staff and students

Preliminary assessment and analysis of the peers:
Each of the four degree programmes runs over a period of 8 semesters with 136 credit points. The workload of the four degree programmes and the course structure are stipulated in course specifications. The credit point system in use at the university is based on the number of contact hours, including lectures, seminars (exercises) and labs (practical courses); these are described in detail in the course specifications including an estimated amount of time for self study. This ranges between 4 to 6 hours per course per week. The study plan shows a semester workload between 14 to 20 credit hours plus the self-study time of the students. Students on average have between 14-20 contact hours per week. The teachers and the students indicate that they assess the weekly work load to be about 40 hours. The peers take positive note that the Course Evaluation Survey (CSE) includes the question (question 16) “The amount of work I had to do in this course was reasonable for the credit hours allocated” which demonstrates that KSU checks each semester systematically whether the overall workload of students is adequate. The students confirm that it is possible to finish the study programmes in the assigned 8 semesters although it requires a lot of efforts. In summary, the auditors conclude that there is no structural pressure on the quality of teaching and the level of education due to the workload. The workload seems to be realistic and peaks in the workload are avoided.

Criterion 2.3 Teaching methodology

Evidence:

- Self-Assessment Reports Mathematics, Physics, Operations Research, Statistics
- Course Specifications
  - Ba Mathematics: https://sciences.ksu.edu.sa/en/node/4000 (accessed 01.12.2017)

  - Ba Operation Research: https://sciences.ksu.edu.sa/sites/sciences.ksu.edu.sa/files/imce_images/stat_en_plan2.pdf (accessed 01.12.2017)
  - Ba Physics: http://sciences.ksu.edu.sa/en/node/2034 (accessed 01.12.2017)
  - Ba Statistics: http://sciences.ksu.edu.sa/sites/sciences.ksu.edu.sa/files/imce_images/stat_en_plan2.pdf (accessed 01.12.2017)

- Report about Strategies and teaching methods employed, and evaluation techniques used
- Discussions with teachers, students, graduates

Preliminary assessment and analysis of the peers:
The peers understand that KSU applies a wide range of didactical approaches to achieve the intended learning outcomes. These include “classical” methods like lectures, classroom and laboratory, computer training, different kinds of assignments or seminars. Courses also involve working in groups or teams in projects to develop social competences. The students confirm that many teachers ask them to work in a group, give them practical exercises or they have to solve problems in front of the class. The students appreciate these kinds of teaching methods but also indicate that other teachers focus very much on “ex-cathedra teaching” which allows very little participation. The student evaluation of the quality of teaching also shows a significantly high amount of students who were not fully satisfied with the quality of teaching. About 20% of the students (partly strongly) disagreed to the question “the course outline (including the knowledge and skills the course was designed to develop) was made clear to me”; another 16% stated that this is true to some extent only. The students stress that they would highly esteem more participatory teaching methods. The peers agree that discussions and interaction with students are immensely contributing to achieving the intended learning outcomes. The peers recommend applying more participatory educational methods to support the students achieving the intended learning outcomes.

Based on the experiences of the peers it is crucial to carry out exercises continuously in all mathematical fields to ascertain that the students verify if they have fully understood the scientific concept. However, the students claim that they do not have to do homework weekly; they have homework to do but not continuously. Or if homework are given they are not graded which demotivates them to do the homework at all. They also complain that the quality of the tutorials differs with regard to person who gives the tutorial; there are also tutorial conducted by graduates which are unsatisfactory from the point of view of the

students. The teachers underline that they offer homework topic-wise. The peers think that topic-wise homework may not be sufficient. To obtain full mathematical competences in all relevant fields of the programmes under accreditation, homework and respective corrections are required continuously. That is why they recommend for concerned programmes to give weekly homework and provide substantial feedback.

With regard to the preparation of students for research, the panel positively noted that, additionally, the course "Learning, Thinking and Research Skills" (CI 140) had been added in the preparatory year. However, the professors explain that they have to fulfil a very high teaching load and a lot of administrative tasks and have only limited time available for research purposes. Consequently, the amount of research conducted in the different departments is not where it should be and hence, only little research is integrated in the teaching and learning of the different programmes which has a negative impact on the achievement of the intended learning outcomes. In the first accreditation it been recommended to integrate key aspects and approaches of current research in the respective field into teaching at the advanced level; the peers do not see that this has been implemented. The peers emphasise that the teaching staff needs to have more time to enhance the research and development activities and bring it in line with the teaching approach to support the students to achieve the level of academic qualification aimed at (compare criterion 4.1).

Criterion 2.4 Support and assistance

Evidence:

- Self-Assessment Reports Mathematics, Physics, Operations Research, Statistics
- Programme Handbooks
- Subject specific website:
    - Mathematics: https://sciences.ksu.edu.sa/en/node/649 (accessed 01.12.2017)
    - Vision Mathematics: https://sciences.ksu.edu.sa/en/node/619 (accessed 01.12.2017)
    - Physics: https://sciences.ksu.edu.sa/en/node/2034 (accessed 01.12.2017)
- Mission Statements:
    - Operations Research: https://sciences.ksu.edu.sa/en/node/4217 (accessed 01.12.2017)
    - Statistics: https://sciences.ksu.edu.sa/en/node/4216 (accessed 01.12.2017)

- http://sciences.ksu.edu.sa/en (accessed 01.12.2017)
- Discussions with students, graduates and teaching staff

Preliminary assessment and analysis of the peers:
The peers examine the services webpage of the Science Department as well as the subject specific webpage of the four degree programmes under accreditation and gained the impression that the information about the study programmes of KSU differs from programme to programme. The peers think that the presentation of the different degree programmes of the department should be consistent for all programmes. The students confirm that they can obtain all relevant information. At the beginning of each semester they receive the syllables for the different modules. For programme related information they can ask senior students; there is also an advisor who can be addressed for more detailed information about specific courses or electives. The professors can also be approached if need arises. The auditors conclude that KSU makes adequate resources available to provide individual assistance, advice and support for all students.

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

As the university relinquished to give any comments, the auditors confirmed their preliminary assessments. They saw the criterion nearly completely fulfilled. Only for the bachelor programme in mathematics the admission requirements need to be introduced that support the students in achieving the learning outcomes. Additionally the auditors recommended for all programmes to give weekly homework and provide feedback. For the statistics programme they recommended introducing compulsory internships to enhance the practical skills and employability of graduates.

3. Exams: System, concept and organisation

Criterion 3 Exams: System, concept and organisation

Evidence:

- Self-Assessment Reports Mathematics, Physics, Operations Research, Statistics
- Programme Handbooks
- Course Specifications
    - Ba Mathematics: https://sciences.ksu.edu.sa/en/node/4000 (accessed 01.12.2017)

  - Ba Operation Research: https://sciences.ksu.edu.sa/sites/sciences.ksu.edu.sa/files/imce_images/stat_en_plan2.pdf (accessed 01.12.2017)
  - Ba Physics: http://sciences.ksu.edu.sa/en/node/2034 (accessed 01.12.2017)
  - Ba Statistics: http://sciences.ksu.edu.sa/sites/sciences.ksu.edu.sa/files/imce_images/stat_en_plan2.pdf (accessed 01.12.2017)

- Annual Course Reports
- Report about Strategies and teaching methods employed, and evaluation techniques used
- Discussions with management, teaching staff and students

Preliminary assessment and analysis of the peers:

Examination organisation

The students receive the syllables with details about the content of the courses at the beginning of each semester. The examination dates are planned and published at the beginning of the semester so that time clashes cannot occur. The exam period of two weeks is held at the end of each semester. No more than two exams can take place during one day. Registration is made online. Make-up exams are possible for students who could not attend the mid-term exams; they are held one week before the final exams. Failed exams cannot be repeated without repeating the whole module but the number of their repetitions is unlimited. Modules are offered each semester. Depending on the grade point average (GPA) reached in the previous semester students are allowed to take more or less courses in order to give students who have failed an exam more time for study. Grades for each module are calculated to specific methods detailed in the course description, depending on the number of exams. The grade point average per semester or for the whole programme is calculated taking into account the credits for each module. The students confirmed that all rules and regulations regarding exams, calculation of grades and pass rates as well as scheduling and re-sits were clear to them and transparently described.

Examination methods

The peers can see from the course specifications that a variety of different continuous and summative assessment methods is used; the weighing factor of the different assessment forms for the final grade of the course is also specified. For the majority of courses, the assessment forms include quizzes, homework, lab assignments, midterm exams and a final

exam. As a rule, the graduation project includes a mandatory colloquium, normally including a presentation. When asked about oral competences the students indicated that oral exams are not regularly part of the curriculum before the graduation project in which a colloquium is mandatory; the course specifications do not mention any oral examination either. In the first accreditation it had been recommended that the attainment of presentation and communication skills as outlined in the programme educational objectives should be reflected more strongly in the assessment forms. Also in the student evaluation, the assessment forms are not included. The auditors cannot see that this recommendation has been considered and led to more oral assessment forms in the programmes. The peers underline that KSU needs to better align the range of possible forms of examination with the intended learning outcomes of the respective module. It was confirmed by the students that the assessment rubrics were made available to the students from the beginning of each course and were transparent; they are also indicated in the course specifications.

Final Thesis

The students need to carry out a research project at the end of the sixth semester. The Bachelor's project is weighted with 3 credit points but the workload of the students surpasses the 3 weekly course hours. The peers cannot see that this has been changed in the course specification. When analysing the final theses of the degree programmes the peers found a number of examples that do not meet the minimum standard of a bachelor's thesis. The scientific deficiencies are connected to topics that were not of appropriate standard, the analysis of the data, structure of the reports or insufficient scientific references. This had also been criticised n the first accreditation where it had been recommended, with view to international competitiveness, to enhance scientific/research aspects in the Bachelor's project (graduation project). The peers cannot see a considerable improvement. According to the lecturers some of the students are simply not capable to perform to an adequate standard. The peers understand that the lack of time for research and research activities of professors in general are a major hindrance for high level final theses; nevertheless the peers reemphasise the importance that the students need to work on a set task independently and reach the scientific level aimed at.

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

As the university relinquished to give any comments, the auditors confirmed their preliminary assessments. They saw the criterion partly fulfilled because it is not yet assured that the final project ensures that students work on a set task independently and reach the level aimed for. Additionally it seems to be necessary to better align the range of possible forms of examination with the intended learning outcomes of the respective module.

4. Resources

Criterion 4.1 Staff

Evidence:

- CVs of teaching staff
- Faculty Employment and Promotion Regulations
- Scientific Research Policy
- Report on Research Strategic Plan
- Discussions with students, teaching staff and management

Preliminary assessment and analysis of the peers:

The peers welcome the overview of teaching staff at the different departments that have been provided. The peers analyze the CV's and the referenced websites and conclude that the composition, scientific orientation and qualification of the teaching staff team are suitable for successfully implementing the degree programmes; many professors come from other countries and have received their certificates from internationally well-known institutions. However, the peers cannot compare the total of the teaching load with the overall teaching obligation. The peers are explained that, theoretically speaking, the teaching load was 14 hours for assistant professors, 12 for associate and 10 for full professors. But in reality, some professors have to exceed the formal teaching load as some tasks that are normally implemented by technical staff or assistants have to be done by the professors themselves. The peers understand that there is a considerable shortage of technical staff and assistants which forces the professors to carry out duties that would normally not be in their scope of responsibilities. This leads to a lack of time for research activities. The fact that homework is not offered continuously or cannot be graded is also caused by the lack of assistants. The peers identify the shortage of technical staff and assistants as a challenge to reach the learning outcomes consistently at a level appropriate for a bachelor degree. As indicated under criterion 2.3 the amount of research carried out at the different degree programmes is far below standard because most professors simply do not have the time to dedicate appropriate time to research activities. In the first accreditation it was also recommended to increase the time available for research activities for the teaching staff; the peers cannot see that this recommendation has been fulfilled. The peers think that it is necessary that KSU develops a concept to ascertain that sufficient technical support staff resources are available to provide adequate assistance and advice to students to support them to reach the intended learning outcomes.

Criterion 4.2 Staff development

Evidence:

- Self-Assessment Reports Mathematics, Physics, Operations Research, Statistics
- Discussions with management and teaching staff

Preliminary assessment and analysis of the peers:
The peers understand that KSU has established a Deanship for Skills Development which organizes workshops and seminars and also identifies the needs of faculty and staff, while planning strategies to meet the identified needs. An orientation and induction Programme for new faculty members has been established offering didactical training courses at the start of each academic year. A new regulation, announced by the Rector, states that those who fail to attend two workshops per year may not be eligible to receive the teaching allowance. However, when asking the staff members it turned out quite a number of male staff members have not participated in any didactical training in recent years; given the fact that some students requested more participatory teaching approaches, a higher participation of staff members in didactical training would be desirable.

Criterion 4.3 Funds and equipment

Evidence:

- Self-Study Reports, including satisfaction surveys
- Discussions with teaching staff and students

Preliminary assessment and analysis of the peers:
Funds

The peers discussed the availability of financial funds with the management and understood that the budget for the departments is divided by the college according to the number of students. The management of the programmes confirmed that the funds provided are sufficient to implement the programmes.

Equipment

During the on-site visit the peers took a tour over the campus to get a first-hand impression of the availability and the condition of the equipment. Generally speaking, the peers gained a positive impression of the infrastructure and equipment. The management explained that there is an annual questionnaire for staff and students to assess the quality of the labs and

other equipment and the budget available is allocated according to the needs. In the KSU 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. The students also confirm that the learning facilities are sufficient in quantity. They express their general satisfaction with the available resources, the technical equipment, the laboratories, and the library. KSU maintains a number of computer rooms and available computers with standard software that can be found at any time. The only drawback the peers identified was the fairly old equipment for basic courses in Physics; the peers recommend making some improvement of the equipment in the Physics Departments (compare criterion1.3).

Cooperation

The peers understand that KSU and the different departments maintain close linkages to external institutions and private companies. Theoretically, alumni and business partners shall be contacted frequently to provide feedback on the performance of students and if certain competences are missing. When being asked only few business representatives and alumni confirmed that they had been contacted and participated in an advisory meeting. Especially the partners from the Statistics field indicated that they are willing and interested to collaborate with KSU to make recommendations on the development of some key skills (compare criterion 1.3). So far they had not been successful to link up with the responsible professors from that department. Also in the light of more practical oriented education and final theses in businesses the peers think that especially in Statistics the links to relevant industry should be enhanced to give students the opportunity to carry out internships and write final theses in cooperation with industry.

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

As the university relinquished to give any comments, the auditors confirmed their preliminary assessments. They saw the criterion partly fulfilled. From their point of view, the teaching staff needs to have more time to enhance the research and development activities and bring it in line with the teaching approach to support the students to achieve the level of academic qualification aimed at. Additionally the panel assessed that there is not sufficient technical support staff resources available to provide adequate assistance and advice to students to support them to reach the intended learning outcomes.

Additionally they recommended for the bachelor programme statistic to enhance the links to relevant industry to give students the opportunity to carry out internships and write final

theses in cooperation with industry. For the bachelor programme physics the peers recommended to modernize the laboratory equipment particularly for the basic courses.

5. Transparency and documentation

Criterion 5.1 Module descriptions

Evidence:

- Course Specifications
    - Ba Mathematics: https://sciences.ksu.edu.sa/en/node/4000 (accessed 01.12.2017)
    - Ba Operation Research: https://sciences.ksu.edu.sa/sites/sciences.ksu.edu.sa/files/imce_images/stat_en_plan2.pdf (accessed 01.12.2017)
    - Ba Physics: http://sciences.ksu.edu.sa/en/node/2034 (accessed 01.12.2017)
    - Ba Statistics: http://sciences.ksu.edu.sa/sites/sciences.ksu.edu.sa/files/imce_images/stat_en_plan2.pdf (accessed 01.12.2017)

Preliminary assessment and analysis of the peers:

The peers positively note that the full set of module descriptions is published for the Ba Mathematics and Ba Physics; however, for the Ba Statstics and Ba Operation Research the peers only found short descriptions of the course specifications (and not the full set) and ask KSU to clarify where the full set of course descriptions can be found on the website. The peers examine the module descriptions and note that the modules have comprehensible names and code numbers; however, some of the English course descriptions still include Arabic signs. Each course has a name of its own, an individual identification number and an indication of the semester when it is taught. The name of the person responsible for the module and the names of the different teachers are provided. The language und the relation to the curriculum are also mentioned. If prerequisites as well as recommended prerequisites for the successful participation in a module are necessary, this is clearly stated. The credit points, the overall time commitment and the contact time are properly subdivided into lectures, practical, laboratory; also the different types of teaching method become transparent in this section. The workload distinguishes between contact time and private study. The leaning outcomes are subdivided into knowledge, cognitive skills, and interpersonal skills which are positively judged by the peers. Additionally, the content of

the different courses is explained in a separate paragraph. The type of examination is mentioned as well as the weighing factor and calculation of the final grade. A reading list is provided in the course descriptions. The peers satisfied with the quality of the module descriptions and think that the recommendation of the first accreditation has been fulfilled.

Criterion 5.2 Diploma and Diploma Supplement

Evidence:

- Response to ASIIN recommendations

Preliminary assessment and analysis of the peers:
The introduction of a Diploma Supplement or a similar document had been a recommendation of the previous accreditation process. However, the institution explained that an introduction had not been possible. While no explanation had been given as to the reasons, the panel reinforced the importance of a Diploma Supplement or similar document to provide external stakeholders, in particular international employers or higher education institutions, with information about the programme and graduates competences. Such a document would not have to be official and could be issued by the College or departments.

Criterion 5.3 Relevant rules

Evidence:

- Programme Handbooks
- Students Code of Conduct
- Report on Programme Requirements and Regulations

Preliminary assessment and analysis of the peers:
Rules and regulations for students' admission, progression, grading and graduation are published primarily in the Programme Handbooks.

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

As the university relinquished to give any comments, the auditors confirmed their preliminary assessments. They saw the criterion completely fulfilled

6. Quality management: quality assessment and development

Criterion 6 Quality management: quality assessment and development

Evidence:

- Self-Study Reports, incl. statistical data
- QMS Handbook (2009)
- Survey Results and Analysis
- Quality Policy of the College , Quality Management System
- Action Plan, Alignment, Strategic Plan
- Benchmark Report
- Independent reviewer report and answers
- Discussions with management, teaching staff, students, graduates, employers

Preliminary assessment and analysis of the peers:
The panel found an extensive quality assurance system, an extensive organisational structure and substantial documentation in place. The quality management system is built on several layers of responsibility and activity, on institutional, College and department level.

The system is closely based on the standards and criteria of the national accreditation agency (NCAAA) as well as the EFQM system. Generally, the College of Science and the departments have developed KPIs for each of their objectives which are annually tracked. The responsibility for this lies with the Steering Committee and its working groups, all of which are jointly implemented by the male and female parts. Annual assessments are implemented to assess the performance on the achievement of objectives. At the same time, the KPIs and benchmarks are used to compare the performance of programmes against each other. An improvement plan is then generated based on the annual check to what extent objectives have been met and to determine improvement actions; responsibilities are assigned.

In the frame of the self-study, carried out every five years, surveys of teaching staff and students are implemented with the aim of ascertaining to what extent the aims and objectives of the programmes are relevant to the daily teaching and learning activities. These surveys also include satisfaction with the provision of teaching and facilities and resources. However, the students reported that they did not receive any feedback on their evaluations

and as they progressed to the next level in their studies they could not judge if any changes were implemented. The peers recommend closing the feedback loops to further develop the quality of the degree programmes.

A graduate database was understood to be in the process of being developed. While in principle the contact details of all graduate were available, it appeared that not much systematic use was made of this information. Similarly, personal relations to certain employers existed and companies were formally involved in enhancement surveys and advisory meetings. However, the panel gained the impression that more effects could be achieved to make use of this information and contacts on programme, rather than college or university level. The panel supported the proposals to organize meetings between these groups with a view to both informing students about future employment opportunities but also to gathering information about skills needed in the labour market that can be used to continuously enhance the programmes.

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

As the university relinquished to give any comments, the auditors confirmed their preliminary assessments. They saw the criterion partly fulfilled generally but recommended further developing the quality assurance system and close the feedback loops to further develop the quality of the degree programs.

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:

- Rules and regulations on recognition of external periods of study

E Summary: Peer recommendations

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	--	30.09.2024
Ba Operation Research	With requirements for one year	--	30.09.2024
Ba Physics	With requirements for one year	--	30.09.2024
Ba Statistics	With requirements for one year	--	30.09.2024

Requirements

For all degree programmes

A 1. (ASIIN 1.1) Draft the educational objectives/learning outcomes so that they describe the academic, subject-specific and professional classification of the qualifications gained in the degree programmes.

A 2. (ASIIN 3) Better align the range of possible forms of examination with the intended learning outcomes of the respective module

A 3. (ASIIN 3) It needs to be assured that the final project ensures that students work on a set task independently and reach the level aimed for.

A 4. (ASIIN 4.1) The teaching staff needs to have more time to enhance the research and development activities and bring it in line with the teaching approach to support the students to achieve the level of academic qualification aimed at.

A 5. (ASIIN 4.1) Develop a concept to ascertain that sufficient technical support staff resources are available to provide adequate assistance and advice to students to support them to reach the intended learning outcomes.

Ba Mathematics

A 6. (ASIIN 2.3) Admission requirements need to be introduced that support the students in achieving the learning outcomes.

Recommendations

E 1. (ASIIN 1.3) It is strongly recommended further developing the (technical) English competences of the students to enable them to participate in international mobility.

E 2. (ASIIN 1.3) It is recommended applying more participatory educational methods to support the students achieving the intended learning outcomes.

E 3. (ASIIN 2.3) It is recommended to give weekly homework and provide feedback.

E 4. (ASIIN 6) It is recommended further developing the quality assurance system and close the feedback loops to further develop the quality of the degree programs.

Ba Statistics

E 5. (ASIIN 4.3) It is recommended enhancing the links to relevant industry to give students the opportunity to carry out internships and write final theses in cooperation with industry

Ba Mathematics, Ba Physics

E 6. (ASIIN 1.3) It is recommended to allow students to chose electives more widely in order to foster interdisciplinary working.

Statistics, OR

E 7. (ASIIN 2.1) It is recommended introducing compulsory internships to enhance the practical skills and employability of graduates.

Ba Physics

E 8. (ASIIN 4.3) It is recommended to modernize the laboratory equipment particularly for the basic courses.

F Comments of the Technical Committees

Technical Committee 12 - Mathematics

The Technical Committee discussed the procedure and added a requirement about the diploma supplement which was remarked in the report. Regarding all other assessments the Technical Committee followed the peers without any changes.

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	--	30.09.2024
Ba Operation Research	With requirements for one year	--	30.09.2024
Ba Physics	With requirements for one year	--	30.09.2024
Ba Statistics	With requirements for one year	--	30.09.2024

Requirements

For all degree programmes

A 1. (ASIIN 1.1) Draft the educational objectives/learning outcomes so that they describe the academic, subject-specific and professional classification of the qualifications gained in the degree programmes.

A 2. (ASIIN 3) Better align the range of possible forms of examination with the intended learning outcomes of the respective module.

A 3. (ASIIN 3) It needs to be assured that the final project ensures that students work on a set task independently and reach the level aimed for.

A 4. (ASIIN 4.1) The teaching staff needs to have more time to enhance the research and development activities and bring it in line with the teaching approach to support the students to achieve the level of academic qualification aimed at.

A 5. (ASIIN 4.1) Develop a concept to ascertain that sufficient technical support staff resources are available to provide adequate assistance and advice to students to support them to reach the intended learning outcomes.

A 6. (ASIIN 5.2) KSU needs to provide a Diploma Supplement or a similar document that contains detailed information about the educational objectives, intended learning outcomes, the structure and the academic level of the degree programme as well as about the individual performance of the student.

Ba Mathematics

A 7. (ASIIN 2.3) Admission requirements need to be introduced that support the students in achieving the learning outcomes.

Recommendations

E 1. (ASIIN 1.3) It is strongly recommended further developing the (technical) English competences of the students to enable them to participate in international mobility.

E 2. (ASIIN 1.3) It is recommended applying more participatory educational methods to support the students achieving the intended learning outcomes.

E 3. (ASIIN 2.3) It is strongly recommended to give weekly homework and provide feedback in line with international standards.

E 4. (ASIIN 6) It is recommended further developing the quality assurance system and close the feedback loops to further develop the quality of the degree programs.

Ba Statistics

E 5. (ASIIN 4.3) It is recommended enhancing the links to relevant industry to give students the opportunity to carry out internships and write final theses in cooperation with industry.

Ba Mathematics, Ba Physics

E 6. (ASIIN 1.3) It is recommended to allow students to choose electives more widely in order to foster interdisciplinary working.

Ba Statistics, Ba OR

E 7. (ASIIN 2.1) It is recommended introducing compulsory internships to enhance the practical skills and employability of graduates.

Ba Physics

E 8. (ASIIN 4.3) It is recommended to modernize the laboratory equipment particularly for the basic courses.

Technical Committee 13 - Physics

The Technical Committee discusses the procedure. From the report, it becomes clear that a requirement regarding the Diploma Supplement has been considered by the peers, however, it is not included in the list of requirements. Thus, the Technical Committee suggest to add a relevant requirement. Apart from this amendment, the Technical Committee only suggests some minor editorial changes.

The Technical Committee 13 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	--	30.09.2024
Ba Operation Research	With requirements for one year	--	30.09.2024
Ba Physics	With requirements for one year	--	30.09.2024
Ba Statistics	With requirements for one year	--	30.09.2024

Requirements

For all degree programmes

A 1. (ASIIN 1.1) Draft the educational objectives/learning outcomes so that they describe the academic, subject-specific and professional classification of the qualifications gained in the degree programmes.

A 2. (ASIIN 3) Better align the range of possible forms of examination with the intended learning outcomes of the respective module.

A 3. (ASIIN 3) It needs to be assured that the final project ensures that students work on a set task independently and reach the level aimed for.

A 4. (ASIIN 4.1) The teaching staff needs to have more time to enhance the research and development activities and bring it in line with the teaching approach to support the students to achieve the level of academic qualification aimed at.

A 5. (ASIIN 4.1) Develop a concept to ascertain that sufficient technical support staff resources are available to provide adequate assistance and advice to students to support them to reach the intended learning outcomes.

A 6. (ASIIN 5.2) KSU needs to provide a Diploma Supplement or a similar document that contains detailed information about the educational objectives, intended learning outcomes, the structure and the academic level of the degree programme as well as about the individual performance of the student.

Ba Mathematics

A 7. (ASIIN 2.3) Admission requirements need to be introduced that support the students in achieving the learning outcomes.

Recommendations

E 1. (ASIIN 1.3) It is strongly recommended to further develop the (technical) English competences of the students to enable them to participate in international mobility.

E 2. (ASIIN 1.3) It is recommended to apply more participatory educational methods to support the students achieving the intended learning outcomes.

E 3. (ASIIN 2.3) It is recommended to give weekly homework and provide feedback.

E 4. (ASIIN 6) It is recommended to further develop the quality assurance system and close the feedback loops to further develop the quality of the degree programs.

Ba Statistics

E 5. (ASIIN 4.3) It is recommended to enhance the links to relevant industry to give students the opportunity to carry out internships and write final theses in cooperation with industry

Ba Mathematics, Ba Physics

E 6. (ASIIN 1.3) It is recommended to allow students to choose electives more widely in order to foster interdisciplinary working.

Ba Statistics, Ba OR

E 7. (ASIIN 2.1) It is recommended to introduce compulsory internships to enhance the practical skills and employability of graduates.

Ba Physics

E 8. (ASIIN 4.3) It is recommended to modernize the laboratory equipment particularly for the basic courses.

G Decision of the Accreditation Committee (23.03.2018)

Assessment and analysis for the award of the ASIIN seal:

The Accreditation Commission for Study Programmes discussed the procedure and followed the assessment of the peers and the Technical Committees without any changes.

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	--	30.09.2024
Ba Operation Research	With requirements for one year	--	30.09.2024
Ba Physics	With requirements for one year	--	30.09.2024
Ba Statistics	With requirements for one year	--	30.09.2024

Requirements

For all degree programmes

A 1. (ASIIN 1.1) Draft the educational objectives/learning outcomes so that they describe the academic, subject-specific and professional classification of the qualifications gained in the degree programmes.

A 2. (ASIIN 3) Better align the range of possible forms of examination with the intended learning outcomes of the respective module.

A 3. (ASIIN 3) It needs to be assured that the final project ensures that students work on a set task independently and reach the level aimed for.

A 4. (ASIIN 4.1) The teaching staff needs to have more time to enhance the research and development activities and bring it in line with the teaching approach to support the students to achieve the level of academic qualification aimed at.

A 5. (ASIIN 4.1) Develop a concept to ascertain that sufficient technical support staff resources are available to provide adequate assistance and advice to students to support them to reach the intended learning outcomes.

A 6. (ASIIN 5.2) KSU needs to provide a Diploma Supplement or a similar document that contains detailed information about the educational objectives, intended learning outcomes, the structure and the academic level of the degree programme as well as about the individual performance of the student.

Ba Mathematics

A 7. (ASIIN 2.3) Admission requirements need to be introduced that support the students in achieving the learning outcomes.

Recommendations

E 1. (ASIIN 1.3) It is strongly recommended further developing the (technical) English competences of the students to enable them to participate in international mobility.

E 2. (ASIIN 1.3) It is recommended applying more participatory educational methods to support the students achieving the intended learning outcomes.

E 3. (ASIIN 2.3) It is recommended to give weekly homework and provide feedback.

E 4. (ASIIN 6) It is recommended further developing the quality assurance system and close the feedback loops to further develop the quality of the degree programs.

Ba Statistics

E 5. (ASIIN 4.3) It is recommended enhancing the links to relevant industry to give students the opportunity to carry out internships and write final theses in cooperation with industry.

Ba Mathematics, Ba Physics

E 6. (ASIIN 1.3) It is recommended to allow students to choose electives more widely in order to foster interdisciplinary working.

Ba Statistics, Ba OR

E 7. (ASIIN 2.1) It is recommended introducing compulsory internships to enhance the practical skills and employability of graduates.

Ba Physics

E 8. (ASIIN 4.3) It is recommended to modernize the laboratory equipment particularly for the basic courses.

Appendix: Programme Learning Outcomes and Curricula

According to the Programme Specifications the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor degree programme Mathematics:

"1. Knowledge

By completing the program, the student is expected to be able to:

1.1 Recall definitions of basic mathematical terms
1.2 State some fundamental mathematical theorems.
1.3 Describe methods of proof.
1.4 Describe mathematical techniques used for solving applied problems.

2. Cognitive Skills

By completing the program, the student is expected to be able to

2.1 Construct rigorous mathematical proofs with clear identification of assumptions and conclusions.
2.2 Analyse and solve problems and reason logically
2.3 Select and apply the appropriate mathematical method needed for the solution of a problem.
2.4 Explain the importance of mathematics to solve problems posed by the others.

3. Interpersonal Skills & Responsibility

By completing the program, the student is expected to be able to:

3.1 To study, learn and work independently.
3.2 To work effectively in teams.
3.3 To meet deadlines and manage time properly.
3.4 To exhibit ethical behaviour and respect different points of view.

4. Communication, Information Technology, Numerical

4.1 To present mathematics to others, both in oral and written form clearly and in a well-organized manner.

4.2 To use IT facilities as an aid to mathematical processes and for acquiring available information.

4.3 Use library to locate mathematical information."

The following **curriculum** is presented:

1st Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**Credits (Lect. - Exre. – Pract.)**
CI 140	Learning, Thinking and Research Skills	-	-	3 (3+0+0)
CHS 150	Health and Fitness	-	-	1 (1+0+0)
ENG 140	English Language (1) **(E)**	-	-	8 (8+0+0)
MATH 140	Introduction to Mathematics **(E)**	-	-	2(1+1+0)
Total of Credit Hours				**14**

2nd Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**Cr (Lect. - Ex**
CT 140	Computer Skills **(E)**	-	-	3 (0
MC 140	Communication Skills	-	-	2 (2
ENG 150	English Language (2) **(E)**	ENG 140	-	8 (8
MATH 150	Differential Calculus **(E)**	MATH 140	-	3(2
ENT 101	Entrepreunership	-	-	1(1
Total of Credit Hours				

3rd Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**Credits (Lect. - Exre. – Pract.)**
CSC 111	Computer programming (1)	CT 140	-	4(3+2+1)
STAT 100	Introduction to Statistics	MATH 150	-	3(2+1+0)
MATH 111	Integral Calculus **(E)**		-	4(3+1+0)
MATH 131	Foundations of Mathematic		-	4(3+1+0)
Elective University requirement course			-	2 (2+0+0)
Total of Credit Hours				**17**

4th Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**Cr (Lect. - Ex**
STAT 105	Statistical Methods **(E)**	-	-	4(3+
PHYS 101	General Physics (1)	-	-	4(3+
MATH 201	Differential and Integral Calculus (E)	MATH 111	-	4(3+
MATH 202	Vector Calculus (E)		MATH 201	4(3+
MATH 246	Linear Algebra	MATH 131	-	4(3+
Total of Credit Hours				

5th Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**Credits (Lect. - Exre. – Pract.)**
MATH 225	Introduction to Differential Equations **(E)**	MATH 201	-	4(3+1+0)
MATH 243	Number Theory	MATH 131	-	4(3+1+0)
MATH 352	Numerical Analysis (1)	MATH 246	-	4(3+1+0)
MATH 382	Real Analysis (1) **(E)**	MATH 201	-	4(3+1+0)
Elective University requirement course			-	2 (2+0+0)
Total of Credit Hours				**18**

6th Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**Cr (Lect. - Ex**
MATH 316	Mathematical Methods **(E)**	MATH 202 + MATH 225	-	4(3
MATH 343	Group Theory	MATH243+ MATH 246	-	4(3
MATH 373	Introduction to Topology **(E)**	MATH 382	-	4(3
Elective University requirement course			-	2 (2
Elective Course			-	
Total of Credit Hours				

7th Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**Credits (Lect. - Exre. – Pract.)**
MATH 425	Partial Differential Equations **(E)**	MATH 316	-	4(3+1+0)
MATH 431	Combinatorics and Graph Theory (1)	MATH 246	-	4(3+1+0)
MATH 441	Rings and Fields	MATH 343	-	4(3+1+0)
MATH 481	Real Analysis (2) **(E)**	MATH 382	-	4(3+1+0)
Total of Credit Hours				**16**

8th Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**Cr (Lect. - Ex**
MATH 473	Introduction to Differential Geometry **(E)**	MATH 202 + MATH 246	-	4(3
MATH 487	Complex Analysis **(E)**	MATH 382	-	4(3
MATH 499	Research Project	Completion of 100 credit	-	3(0
Elective University requirement course			-	2 (2
Elective Course			-	
Total of Credit Hours				

(Lect - Exer – Pract) = (Lecture – Exercise – Practical)

List of the Elective Courses of the University Requirements
(Student elects 8 credit hours)

Course Code	Course Title	Pre-requisite	Credits (Lect. – Exer. - Pract.)
IC 100	Studies in the Biography of the Prophet	-	2 (2+0+0)
IC 101	Introduction of Islamic Culture	-	2 (2+0+0)
IC 102	Islam and Building up the Society	-	2 (2+0+0)
IC 103	Economic System in Islam	-	2 (2+0+0)
IC 104	Political system in Islam	-	3 (2+0+1)
IC 105	Human Rights	-	3 (2+0+1)
IC 106	Islamic Jurisprudence	-	2 (2+0+0)
IC 107	Ethics of Occupation	-	2 (2+0+0)
IC 108	Contemporary Issues	-	2 (2+0+0)
IC 109	Woman and Her Developmental Role	-	2 (2+0+0)

List of the Elective Courses ***(Student elects 7 credit hours)***

Course Code	Course Title	Pre-requisite	Credits (Lect - Exer- Prac
MATH 379	Foundations of Euclidean and Non-Euclidean Geometry	MATH 202 + MATH 246	4 (3+1+0)
MATH 391	History of Mathematics	MATH 243	2 (2+0+0)
MATH 426	Modeling in Mathematical Biology **(E)**	MATH 225	3 (3+0+0)
MATH 433	Combinatorics and Graph Theory (2)	MATH 431	4 (3+1+0)
MATH 436	Mathematical Logic **(E)**	MATH 131	4 (3+1+0)
MATH 442	Applications of Algebra	MATH 441	4 (3+1+0)
MATH 453	Numerical Analysis (2) **(E)**	MATH 352	4 (3+1+0)
MATH 456	Introduction to Mathematical Programming	MATH 246	3 (2+1+0)
MATH 466	Dynamical Systems and Chaos **(E)**	MATH 316	4 (3+1+0)
MATH 482	Multivariable Calculus **(E)**	MATH 246 + MATH 481	3 (2+1+0)
STAT 215	Probability (1)	STAT 100 + MATH 111	4 (3+1+0)
PHYS 102	General Physics (2)	-	4 (3+0+1)
ECON 101	Principles of Microeconomics	-	3
ECON 102	Principles of Macroeconomics	ECON 101	3
CSC 113	Computer Programming (2)	CSC 111	4 (3+0+1)

List of service courses to Other Specialization and colleges.

Course Code	Course Title	Pre-requisite	Credits (Lect. – Exer.- Pract.)	Specialization / College o
MATH 104	General mathematics (2)	MATH 150	3 (3+0+0)	Agriculture – Architecture a Planning
MATH 106	Integral Calculus		3 (3+0+0)	Engineering – Computer Scie
MATH 107	Vectors and matrices		3 (3+0+0)	Engineering
MATH 111	Integral Calculus		4 (3+1+0)	STAT - OPER - PHYS - CHE GPH
MATH 151	Discrete Math		3 (3+0+0)	Computer Sciences
MATH 200	Integral and Differential Calculus	MATH 111	3 (3+0+0)	GPH - Computer Sciences
MATH 203	Integral and Differential Calculus	MATH 106 + MATH 107	3 (3+0+0)	Engineering
MATH 204	Differential Equations	MATH 200 ***OR*** MATH 201 ***OR*** MATH 203	3 (3+0+0)	GPH – Engineering - Compu Sciences
MATH 207	Advanced Integral and Differential Calculus	MATH 111	3 (2+1+0)	OPER + STAT
MATH 209	Differential Equations		4 (3+1+0)	PHYS
MATH 244	Linear Algebra	MATH 102 ***OR*** MATH 106 ***OR*** MATH 107	3 (3+0+0)	OPER - STAT - Engineerin Computer Sciences
MATH 254	Numerical Methods	MATH 107 ***OR*** MATH 202 ***OR*** MATH 244) + (CSC 101 ***OR*** CSC 206 ***OR*** CSC 207)	3 (3+0+0)	Engineering

According to the Programme Specifications the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor degree programme Operation Research:

1. "Knowledge
   1.1 Identify the concept of convex analysis and its influences on OR problems.
   1.1 Recognize linear and nonlinear optimality and their roles in solving problems.
   1.2 Recognize theories and methods applied to for interpreting and analyzing data related to OR.
   1.3 Recognize the basics of OR and their roles in dealing with economy.
   1.4 Distinguish the numerical methods and their usage to get solutions of applications from industry and market, and the different ways in which numerical information is used.
   1.5 Explain mathematical terminology, nomenclature and classification systems.
2 Cognitive Skills
   2.1 Differentiate between theories of OR theories and principles and then assess their concepts and principles.
   2.2 Interpret quantitative and qualitative data based on OR and statistical analysis. Analyze, assess and interpret qualitatively and quantitatively relevant data.
   2.3 Postulate and build up deduce OR mechanisms and procedures that can be used to handle scientific problems.
   2.4 Formulate abstract OR ideas and procedures using appropriate mathematical vocabulary and notation.
   2.5 Develop connections within branches of OR and between mathematics and other disciplines.
3 Interpersonal Skills & Responsibility
   3.1 Work in teams in order to plan, execute, report and present OR based projects
   3.2 Ability to learn independently using a variety of media, including electronic media
   3.3 Ability to demonstrate a range of skills in OR to be able to understand and formulate a data based problem in statistical terms.
4 Communication, Information Technology, Numerical
   4.1 Communicate OR clear and concise manner appropriate to the context
   4.2 Ability to present results OR analyses through written and oral presentations
   4.3 Using Information technology skills for communication and analysis"

The following **curriculum** is presented:

1st Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**Credits (Lect.- Exre.-Pract.)**
CI 140	Learning, Thinking and Research Skills	-	-	3 (3+0+0)
CHS 150	Health and Fitness (2)	-	-	1 (1+0+0)
ENG 140	English Language (1) **(E)**	-	-	8 (8+0+0)
MATH 140	Introduction to Mathematics **(E)**	-	-	2 (1+1+0)
Total of Credit Hours				**14**

2nd Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**Credi (Lect.- Exre**
CT 140	Computer Skills **(E)**	-	-	3 (0+0
MC 140	Communication Skills	-	-	2 (2+0
ENG 150	English Language (2) **(E)**	ENG 140	-	8 (8+0
MATH 150	Differential Calculus **(E)**	MATH 140	-	3 (2+1
ENT 101	Entrepreunership	-	-	1 (1+0
Total of Credit Hours				**17**

3rd Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**Credits (Lect. - Exre. – Pract.)**
OPER 100	Introduction to Operations Research	MATH 150	STAT 100	4(3+1+0)
STAT 100	Introduction to Statistics		-	3(2+1+0)
MATH 111	Integral Calculus (E)		-	4(3+1+0)
CSC 201	Computer Programming (E)	-	-	4(3+1+0)
Elective University requirement course			-	2(2+0+0)
Total of Credit Hours				**17**

4th Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**Credi (Lect. - Exre.**
OPER 213	Linear Programming	OPER 100	MATH 244	4(3+1
STAT 105	Statistical Methods (E)	STAT 100	-	4(3+1
MATH 244	Linear Algebra (E)	MATH 111	-	3(3+0
CSC 202	Computer Programming Using MATLAB (E)	CSC 201	-	3(2+1
Elective University requirement course			-	2(2+0
Elective University requirement course			-	2(2+0
Total of Credit Hours				**18**

5th Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**Credits (Lect. - Exre. – Pract.)**
OPER 351	Network Analysis	OPER 213 + CSC 202	MATH 207	3(2+1+0)
OPER 382	Decision and Game Theory	OPER 213	-	4(3+1+0)
STAT 215	Probability I	STAT 100+ MATH 111	-	4(3+1+0)
STAT 328	Statistical Packages	STAT 105	-	3(2+1+0)
MATH 207	Advanced Integral and Differential Calculus (E)	MATH 111	-	3(2+1+0)
Total of Credit Hours				**17**

6th Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**Credi (Lect. - Exre.**
OPER 322	Inventory Control	OPER 213 + MATH 207	-	3(2+1
OPER 331	Non-Linear Optimization	OPER 213 + MATH 207	-	4(3+1
STAT 223	Theory of Statistics I	STAT 215	-	3(2+1
STAT 332	Regression Analysis	STAT 328 + MATH 244	-	3(2+1
Optional course outside the Department			-	3
Elective University requirement course			-	2(2+0
Total of Credit Hours				**18**

7th Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**Credits (Lect. - Exre. – Pract.)**
OPER 435	Numerical Methods in Operations Research (E)	231 OPER + OPER 351	-	3(2+1+0)
OPER 441	Modelling and Simulation (E)	STAT 215 + CSC 202	-	4(3+1+0)
OPER 472	Stochastic Processes and Queuing Theory (E)	OPER 213 + STAT 215	-	4(3+1+0)
OPER 497	Graduation Project (1) (E)	OPER 351	OPER 435 + OPER 441 + OPER 472	1(1+0+0)
Optional course from the Department			-	3
Optional course outside the Department			-	3
Total of Credit Hours				**18**

8th Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**Credi (Lect. - Exre.**
OPER 498	Graduation Project (2)(E)	OPER 497	-	2(2+0
STAT 436	Time Series and Forecasting	STAT 332	-	3(2+1
Optional course from the Department			-	3
Optional course from the Department			-	3
Optional course from the Department			-	3
Optional course outside the Department			-	3
Total of Credit Hours				**17**

(Lect. – Exer. – Pract.) = (Lecture – Exercise – Practical)

List of the Elective Courses of the University Requirements

(Student elects 8 credit hours)

Course Code	Course Title	Pre-requisite	Credits (Lect. – Exer. - Pract.
IC 100	Studies in the Biography of the Prophet	-	2 (2+0+0)
IC 101	Introduction of Islamic Culture	-	2 (2+0+0)
IC 102	Islam and Building up the Society	-	2 (2+0+0)
IC 103	Economic System in Islam	-	2 (2+0+0)
IC 104	Political system in Islam	-	3 (2+0+1)
IC 105	Human Rights	-	3 (2+0+1)
IC 106	Islamic Jurisprudence	-	2 (2+0+0)
IC 107	Ethics of Occupation	-	2 (2+0+0)
IC 108	Contemporary Issues	-	2 (2+0+0)
IC 109	Woman and Her Developmental Role	-	2 (2+0+0)

List of the Elective Courses

Elective courses *from* the Department: (Student elects 12 credit hours)				
Course Code	Course Title	Pre-requisite	Co-requisite	Credits (Lect - Exer-
OPER 313	Integer Programming	OPER 213	-	3(2+1+0
OPER 453	Scheduling and Sequencing (E)	OPER 213	-	3(2+1+0
OPER 490	Special Applications in Operations Research (E)	OPER 331+ OPER 351	-	3(2+1+0
OPER 492	Prices and Revenue Management (E)	OPER 331+ STAT 215	-	3(2+1+0
STAT 315	Probability (2) (E)	STAT 215+ MATH 207	-	3(2+1+0
STAT 319	Theory of Statistics (2) (E)	STAT 223 + MATH 207	STAT 315	3(2+1+0
STAT 325	Decisions Theory (E)	STAT 223	-	3(2+1+0
STAT 333	Nonparametric Statistical Methods	STAT 105	-	3(2+1+0
STAT 331	Sampling Techniques	STAT 223	-	3(2+1+0
STAT 362	Reliability Theory	STAT 223	-	3(2+1+0
STAT 401	Econometrics (E)	STAT 332	-	3(2+1+0
STAT 430	Insurance Methods (E)	STAT 319	-	3(2+1+0
STAT 434	Linear Models	MATH 244	-	3(2+1+0
STAT 437	Design and Analysis of Experiments	STAT 328	-	3(2+1+0
STAT 441	Quality Control	STAT 319	-	3(2+1+0

Elective courses *from outside* the Department: (Student elects 9 credit hours)				
Course Code	**Course Title**	**Pre-requisite**	**Co-requisite**	**(Lect -**
MATH 160	Computational Mathematics	CT 140 + MATH 111		2(
MATH 225	Introduction to Differential Equations	MATH 207		4(
MATH 352	Numerical Analysis (1)	MATH 160 + MATH 244		4(
MATH 382	Real Analysis I	MATH 207		4(
MGT 101	Principles of Management and Business			3(
MGT 102	Human Resources Management	MGT 101		3(
MGT 103	Entrepreneurship	MGT 101		3(
MGT 104	Principles of Public Administration			3(
MGT 319	Management of Small and Medium Size Businesses	MGT 101		3(
MGT 371	Operations Management	MGT 101		3(
MIS 201	Management Information Systems	MGT 101		3(
ACCT 201	Principles of Accounting and Financial Reporting			3(
ACCT 202	Principles of Cost Managerial Accounting	ACCT 201		3(
ACCT 311	Accounting for Government and Non-Profit Organizations	ACCT 201		3(
ACCT 317	Intermediate Accounting (1)	ACCT 201		3(
ACCT 318	Intermediate Accounting (2)	ACCT 317		3(
ECON 101	Principles of Microeconomics			3(
ECO N 102	Principles of Macroeconomics	ECON 101		3(
ECO N 201	Microeconomics Analysis	ECON 102		3(
ECON 202	Macroeconomics Analysis	ECON 102		3(
ECON 211	Money and Banking	ECON 102		3(
ECON 314	Islamic Economics	ECON 102		3(
ECON 317	Managerial Economics	ECON 102		3(
ECON 318	Transportation and Insurance Economics	ECON 102		3(
MKT 201	Principles of Marketing	MGT 101 + Econ 101		3(
FIN 200	Principles of Finance	ACCT 201		3(
FIN 210	Corporate Finance	FIN 200		3(
FIN 220	Investment Essentials	FIN 200		3(
FIN 230	Financial markets and institutions	FIN 200		3(
FIN 240	Principles of Risk & Insurance	FIN 200		3(
FIN 250	International Finance	FIN 200		3(
QUA 127	Mathematics of Finance	MATH 140		3(

According to the Programme Specifications the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor degree programme Physics:

„1. Knowledge

1.1 Define the most fundamental concepts, principles and terminology of physics

1.2 Recognize appropriate tools and techniques that may be used to solve the problems they will face

1.3 Describe and comment on different methodologies in physics

2. Cognitive Skills

2.1 Apply their knowledge and understanding to solve qualitative and quantitative problems of a familiar and unfamiliar nature

2.2 Execute and analyze critically the results of an experimental investigation and draw valid conclusions

2.3 Construct their experimental work to investigate some aspect of a problem

3. Interpersonal Skills & Responsibility

3.1 Learn independently Lectures

3.2 Work as a team

3.3 Acknowledge others' work

3.4 Be self-disciplined

4. Communication, Information Technology, Numerical

4.1 Research in web sites

4.2 Calculate and interpret the results using computer programs

5. Psychomotor

5.1 Operates and uses equipment/tools/machinery appropriately

5.2 Takes precise and accurate measurements“

The following **curriculum** is presented:

1st Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**Credits (Lect.- Exre.-Pract.)**
CI 140	Learning, Thinking and Research Skills	-	-	3 (3+0+0)
CHS 150	Health and Fitness (2)	-	-	1 (1+0+0)
ENG 140	English Language (1) (E)	-	-	8 (8+0+0)
MATH 140	Introduction to Mathematics (E)	-	-	2 (1+1+0)
Total of Credit Hours				**14**

2nd Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**(L**
CT 140	Computer Skills (E)	-	-	
MC 140	Communication Skills	-	-	
ENG 150	English Language (2) (E)	ENG 140	-	
MATH 150	Differential Calculus (E)	140 MATH	-	
ENT 101	Entrepreunership	-	-	
Total of Credit Hours				

3rd Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**Credits (Lect. Exre. –Pract.)**
110 PHYS	General Physics (1)	140 MATH	-	4(3+0+1)
111 PHYS	General Physics (2)		-	4(3+0+1)
111 MATH	Methods of Integration (E)	150 MATH	-	4(3+1+0)
201 PHYS	Mathematical Physics I (E)		-	3(2+1+0)
Elective course from University requirement			-	2(2+0+0)
Total of Credit Hours				**17**

4th Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**(L**
209 MATH	Differential Equations	111 Math	-	
210 PHYS	Classical Mechanics I	150 Math	-	
222 PHYS	Electromagnetism	111 PHYS+	-	
234 PHYS	Vibrations and Waves	111 MATH	-	
Elective course from outside the speci. (list A)			-	
Total of Credit Hours				

5th Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**Credits (Lect. Exre. –Pract.)**
301 PHYS	Mathematical Physics II (E)	209 MATH	-	3(2+1+0)
312 PHYS	Classical Mechanics II	210 PHYS	-	3(3+0+0)
331 PHYS	Optics	201 PHYS	-	3(3+0+0)
352 PHYS	Modern Physics (E)	111 PHYS	301 PHYS	4(3+0+1)
394 PHYS	Electromagnetism Laboratory	222 PHYS	-	2(0+0+2)
395 PHYS	Wave Physics Laboratory	234 PHYS	331 PHYS	2(0+0+2)
Total of Credit Hours				**17**

6th Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**(L**
325 PHYS	Electronics	222 PHYS	371 PHYS	
343 PHYS	Thermal and Statistical Physics (E)	209 MATH	-	
371 PHYS	Solid State Physics I	352 PHYS	-	
391 PHYS	Thermodynamic Laboratory	-	343 PHYS	
396 PHYS	Modern Physics Laboratory	352 PHYS	-	
Elective course from University requirement				
Total of Credit Hours				

7th Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**Credits (Lect. Exre. –Pract.)**
400 PHYS	Computational Physics	301 PHYS	-	2(1+0+1)
404 PHYS	Mathematical Physics III		-	3(3+0+0)
453 PHYS	Quantum Mechanics (E)	352 PHYS	-	4(3+1+0)
481 PHYS	Nuclear physics I (E)	352 PHYS	-	3(3+0+0)
490 PHYS	Research Skills	396 PHYS	-	2(0+0+2)
Elective course from outside the speci. (list A)				3(3+0+0)
Total of Credit Hours				**17**

8th Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**(L**
491 PHYS	Solid state physics laboratory	371 PHYS +396 PHYS	-	
492 PHYS	Nuclear physics laboratory	481 PHYS +396 PHYS	-	
499 PHYS	Research Project	400 PHYS +453 PHYS	-	
Elective course from University requirement			-	
Elective course from University requirement			-	
Elective 1 course from inside the speci. (list B1)			-	
Elective 2 courses from inside the speci. (list B2)			-	
Total of Credit Hours				

(Lect - Exer – Pract) = (Lecture – Exercise – Practical)

List of the Elective Courses of the University Requirements
(Student elects 8 credit hours)

Course Code	Course Title	Pre-requisite	Credits (Lect. – Exer. - Pract.)
IC 100	Studies in the Biography of the Prophet	-	2 (2+0+0)
IC 101	Introduction of Islamic Culture	-	2 (2+0+0)
IC 102	Islam and Building up the Society	-	2 (2+0+0)
IC 103	Economic System in Islam	-	2 (2+0+0)
IC 104	Political system in Islam	-	3 (2+0+1)
IC 105	Human Rights	-	3 (2+0+1)
IC 106	Islamic Jurisprudence	-	2 (2+0+0)
IC 107	Ethics of Occupation	-	2 (2+0+0)
IC 108	Contemporary Issues	-	2 (2+0+0)
IC 109	Woman and Her Developmental Role	-	2 (2+0+0)

List of the Elective Courses

A- Elective requirement courses from *OUTSIDE* the Specialization
(The student elects 6 credit hours)

(List A):

Course Code	Course name	Credit (Lect - Exer- Pract)
102 ASTR	Introduction to Stellar and Solar System	3 (2+0+1)
100 STAT	Introduction of Statistics	3 (2+1+0)
103 CHEM	General Chemistry-1	3 (3+0+0)
140 MBIO	Microbiology	3 (2+0+1)
student chooses only two courses		

B- Elective requirement courses from the Specialization (List B)
(The student elects 7 credit hours)

(List B1):

Course Code	Course Title	Pre-req.	Credits (Lect - Exer- Pract
435 PHYS	Laser Physics	331 PHYS	3(3+0+0)
460 PHYS	Biophysics	481 PHYS	3(3+0+0)
473 PHYS	Material Science	371 PHYS	3(2+1+0)
477 PHYS	Energy & Environment Physics	371 PHYS	3(3+0+0)
12 credit hours, *student chooses 1 course only 3 credit hours*			

(List B2):

Course Code	Course Title	Pre-req.	Co-req.	Credit Lect - Exer- Pract
411 PHYS	Astrophysics I	102 ASTR	-	2 (2+0+0)
412 PHYS	Astrophysics II		-	2 (2+0+0)
423 PHYS	Semiconductor Physics	371 PHYS	-	2 (2+0+0)
456 PHYS	Atomic and Molecular Spectroscopy	453 PHYS	-	2 (2+0+0)

457 PHYS	Laser laboratory	435 PHYS	435 PHYS	2 (0+0+2)
462 PHYS	Medical Physics	481 PHYS	460 PHYS	2 (2+0+0)
463 PHYS	Solid State Physics II	371 PHYS	-	2 (2+0+0)
476 PHYS	Nano Science and Technology	373 PHYS	473 PHYS	2 (2+0+0)
480 PHYS	Elementary Particles Physics	453 PHYS	-	2 (2+0+0)
483 PHYS	Nuclear Physics II	481 PHYS	-	2 (2+0+0)
485 PHYS	Accelerators Physics		-	2 (2+0+0)
486 PHYS	Radiation Physics		-	2 (2+0+0)
488 PHYS	Nuclear Reactors Physics		-	2 (2+0+0)
26 credit hours, student chooses 2 courses 4 credit hours				

List of service courses to other Departments and Colleges.

Course Code	Course Title	Credits (Lect. – Exer.- Pract.)	Department/College of
PHYS 101	General Physics (1)	4 (3+0+1)	GEO - GPH - Agriculture
PHYS 102	General Physics (2)	4 (3+0+1)	CHEM - GPH
PHYS 103	General Physics	4 (3+0+1)	Engineering
PHYS 104	General Physics	4 (3+0+1)	Engineering - Computer Sciences
PHYS 105	General Physics	2 (1+0+1)	Architecture and Planning
PHYS 145	General Physics	3 (2+0+1)	Health Scinces
PHYS 201	Mathematical Physics (1)	3 (2+1+0)	GPH
PHYS 205	Biophysics	2 (2+0+0)	ZOOL
PHYS 209	General Biophysics (1)	3 (3+0+0)	BOT MBIO
PHYS 221	Electromagnetism (1)	3 (3+0+0)	GPH
PHYS 232	Vibration and waves	3 (2+1+0)	

According to the Programme Specifications the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor degree programme Statistics:

1st Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**Credits (Lect.- Exre.-Pract.)**
CI 140	Learning, Thinking and Research Skills	-	-	3 (3+0+0)
CHS 150	Health and Fitness (2)	-	-	1 (1+0+0)
ENG 140	English Language (1) **(E)**	-	-	8 (8+0+0)
MATH 140	Introduction to Mathematics **(E)**	-	-	2 (1+1+0)
Total of Credit Hours				**14**

2nd Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**(Lect.-**
CT 140	Computer Skills **(E)**	-	-	3
MC 140	Communication Skills	-	-	2
ENG 150	English Language (2) **(E)**	ENG 140	-	8
MATH 150	Differential Calculus **(E)**	MATH 140	-	3
ENT 101	Entrepreunership	-	-	1
Total of Credit Hours				

3rd Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**Credits (Lect. - Exre. – Pract.)**
STAT 100	Introduction to Statistics	MATH 150		3(2+1+0)
OPER 100	Introduction to Operations Research		STAT 100	4(3+1+0)
MATH 111	Integral Calculus (E)		-	4(3+1+0)
Elective University requirement course			-	2(2+0+0)
Elective University requirement course			-	2(2+0+0)
Optional course from Group B			-	3
Total of Credit Hours				**18**

4th Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**(Lect. -**
STAT 105	Statistical Methods	STAT 100	-	4(
CSC 201	Computer Programming (E)	-	-	4(
MATH 244	Linear Algebra (E)	MATH 111	-	3(
MATH 207	Advanced Integral and Differential Calculus (E)		-	3(
STAT 215	Probability (1)	STAT 100 + MATH 111	-	4(
Total of Credit Hours				

5th Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**Credits (Lect. - Exre. – Pract.)**
CSC 202	Computer programming using MATLAB (E)	CSC 201	-	3(2+1+0)
STAT 223	Theory of Statistics (1)	STAT 215	-	3(2+1+0)
STAT 328	Statistical Packages (E)	STAT 105	-	3(2+1+0)
Elective University requirement course			-	2(2+0+0)
Elective University requirement course			-	2(2+0+0)
Optional course from Group B			-	3(3+0+0)
Total of Credit Hours				**16**

6th Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**(Lect. -**
STAT 315	Probability (2) (E)	STAT 215 + MATH 207	-	3(
STAT 319	Theory of Statistics (2) (E)	STAT 222 + MATH 207	STAT 315	3(
STAT 333	Nonparametric Statistical methods	STAT 105	-	3(
STAT 331	Sampling techniques	STAT 223	-	3(
STAT 332	Regression analysis	STAT 328 + MATH 244	-	3(
Optional course from Group B			-	
Total of Credit Hours				

7th Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**Credits (Lect. - Exre. – Pract.)**
436 STAT	Time Series and Forecasting	STAT 332	-	3(2+1+0)
437 STAT	Design and Analysis of Experiments	STAT 328	-	3(2+1+0)
438 STAT	Multivariate Statistical Methods	STAT 332	-	3(2+1+0)
497 STAT	Graduation Project (1) (E)		STAT 436 + STAT 438	1(1+0+0)
Optional course from Group A			-	7
Total of Credit Hours				**17**

8th Semester				
Course Code	**Course Title**	**Pre-Req.**	**Co-Req.**	**(Lect**
STAT 439	Data Analysis (E)	STAT 436 + STAT 438	-	3(
STAT 441	Quality control	STAT 319	-	3(
STAT 401	Econometrics (E)	STAT 332	-	3(
STAT 498	Graduation Project(2) (E)	STAT 497	-	2(
Optional decision from Group			-	
Total of Credit Hours				

List of the Elective Courses of the University Requirements

(Student elects 8 credit hours)

Course Code	Course Title	Pre-requisite	Credits (Lect. – Exer. - Pract.)
IC 100	Studies in the Biography of the Prophet	-	2 (2+0+0)
IC 101	Introduction of Islamic Culture	-	2 (2+0+0)
IC 102	Islam and Building up the Society	-	2 (2+0+0)
IC 103	Economic System in Islam	-	2 (2+0+0)
IC 104	Political system in Islam	-	3 (2+0+1)
IC 105	Human Rights	-	3 (2+0+1)
IC 106	Islamic Jurisprudence	-	2 (2+0+0)
IC 107	Ethics of Occupation	-	2 (2+0+0)
IC 108	Contemporary Issues	-	2 (2+0+0)
IC 109	Woman and Her Developmental Role	-	2 (2+0+0)

List of the Elective Courses

Elective courses *from* the Department (Group A): *(Student elects 14 credit hours)*				
Course Code	Course Title	Pre-requisite	Co-requisite	Credits (Lect - Exer- Prac
STAT 231	Population study "Demography"	STAT 100	-	2 (1+1+0)
STAT 325	Decisions Theory	STAT 223	-	3 (2+1+0)
STAT 362	Reliability Theory	STAT 223	-	3 (2+1+0)
STAT 399	Longitudinal Data Analysis	STAT 332	-	3 (2+1+0)
STAT 406	Survival Analysis	STAT 223	-	3 (2+1+0)
STAT 430	Insurance Methods	STAT 326	-	3 (2+1+0)
STAT 432	Survey Methods	STAT 331	-	2 (1+1+0)
STAT 434	Linear Models	MATH 244	-	3 (2+1+0)
OPER 213	Linear Programming	OPER 100	MATH 244	4 (3+1+0)
OPER 322	Inventory Control	OPER 213 + MATH 207	-	3 (2+1+0)
OPER 351	Network Analysis	OPER 213 + CSC 202	-	3 (2+1+0)
OPER 441	Modeling and Simulation	STAT 215 + CSC 201	-	4 (3+1+0)
OPER 472	Stochastic Processes and Queues	OPER 213 + STAT 215	-	4 (3+1+0)

Elective courses *from outside* the Department (Group B): *(Student elects 9 credit hours)*				
Course Code	**Course Title**	**Pre-requisite**	**Co-requisite**	**Credits (Lect. – Exer. – Pract.)**
MATH 225	Introduction to Differential Equations	MATH 207	-	4 (3+1+0)
MATH 352	Numerical Analysis (1)	MATH 244	-	4 (3+1+0)
MATH 382	Real Analysis (1)	MATH 207	-	4 (3+1+0)
ACCT 202	Principles of Cost Managerial Accounting	ACCT 201	-	3
ACCT 311	Accounting for Government and Non-Profit Organizations	ACCT 201	-	3
ACCT 317	Intermediate Accounting (1)	ACCT 201	-	3
ACCT 318	Intermediate Accounting (2)	ACCT 317	-	3
ECON 101	Principles of Microeconomics		-	3
ECON 102	Principles of Macroeconomics	ECON 101	-	3
ECO N 201	Microeconomics Analysis	ECON 102	-	3
ECON 202	Macroeconomics Analysis	ECON 102	-	3
ECON 211	Money and Banking	ECON 102	-	3
ECON 314	Islamic Economics	ECON 102	-	3
ECON 317	Managerial Economics	ECON 102	-	3
ECON 318	Transportation and Insurance Economics	ECON 102	-	3
MKT 201	Principles of Marketing	MGT 101 Econ 101	-	3
FIN 200	Principles of Finance	ACCT 201	-	3
FIN 210	Corporate Finance	FIN 200	-	3
FIN 220	Investment Essentials	FIN 200	-	3
FIN 230	Financial markets and institutions	FIN 200	-	3
FIN 240	Principles of Risk & Insurance	FIN 200	-	3
FIN250	International Finance	FIN 200	-	3
QUA 127	Mathematics of Finance	MATH 140	-	3

List of service courses to other Specialization and Colleges.

Course Code	**Course Title**	**Credits (Lect. – Exer.- Pract.)**	College of
STAT 100	Introduction to Statistics	3 (2+1+0)	GEO - MATH - OPER - Agriculture
STAT 105	Statistical Methods	4 (3+1+0)	OPER + Math
STAT 106	Biostatistics	2 (1+1+0)	MBIO – ZOOL -Agriculture
STAT 122	Applied statistics (1)	3 (2+1+0)	Agriculture - Arts
STAT 145	Biostatistics	2 (1+1+0)	Health Science
STAT324	Probability and statistics for Engineers and scientists	3 (2+1+0)	Engineering - Computer Sciences - Architecture and Planning