



**ASIIN Seal**

## **Accreditation Report**

**Bachelor's Degree Programme**

***BSc Chemistry***

***BSc Biochemistry***

***BSc Botany***

***BSc Microbiology***

Provided by

**King Saud University (Female Campus), Riyadh, Saudi  
Arabia**

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## A About the Accreditation Process

Name of the degree programme (in original language)	(Official) English translation of the name	Labels applied for <sup>1</sup>	Previous accreditation (issuing agency, validity)	Involved Technical Committees (TC) <sup>2</sup>
BSc Chemistry	/	ASIIN	ASIIN Seal 2011 - 2016	09, 10
BSc Biochemistry	/	ASIIN	ASIIN Seal 2011 -2016	09, 10
BSc Microbiology	/	ASIIN		09, 10
BSc Botany	/	ASIIN		09, 10
<b>Date of the contract:</b> 13.12.2016  <b>Submission of the final version of the self-assessment report:</b> 07.06.2017  <b>Date of the onsite visit:</b> 27. – 29.11.2017  <b>at:</b> Riyadh (Female Campus)				
<b>Peer panel:</b>  Prof. Dr. Beate Brand-Saberi, Ruhr University Bochum  Dr. Ruth Lohwasser, BASF SE  Prof. Dr. Marina Vogel, University of Applied Sciences Dresden  Prof. Dr. Carla Vogt, Technical University Freiberg  Omnia Maroof, Student				
<b>Representative of the ASIIN headquarter:</b> Stefanie Lochbaum				
<b>Responsible decision-making committee:</b> Accreditation Commission for Degree Programmes				

<sup>1</sup> ASIIN Seal for degree programmes

<sup>2</sup> TC: Technical Committee for the following subject areas: TC 09 - Chemistry; TC 10 - Life Sciences

<p><b>Criteria used:</b></p> <p>European Standards and Guidelines as of 15.05.2015</p> <p>ASIIN General Criteria, as of 10.12.2015</p> <p>Subject-Specific Criteria of Technical Committee 09 – Chemistry as of 09.12.2015</p> <p>Subject-Specific Criteria of Technical Committee 10 – Life Sciences as of 09.12.2015</p>	
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## B Characteristics of the Degree Programmes

a) Name	Final degree (original/English translation)	b) Areas of Specialization	c) Corresponding level of the EQF <sup>3</sup>	d) Mode of Study	e) Double/Joint Degree	f) Duration	g) Credit points/unit	h) Intake rhythm & First time of offer
Chemistry	B.Sc.	/	6	Full time	/	8 Semester	136 Saudi CP	Fall Semester
Biochemistry	B.Sc.	/	6	Full time	/	8 Semester	136 Saudi CP	Fall Semester
Botany	B.Sc.	/	6	Full time	/	8 Semester	136 Saudi CP	Fall Semester
Microbiology	B.Sc.	/	6	Full time	/	8 Semester	136 Saudi CP	Fall Semester

For the Bachelor's degree program Chemistry the institution has presented the following profile in the self-assessment report:

"Department of Chemistry was founded in 1378-1379 H. (corresponding to 1958/1959 A.D.) with the foundation of College of Science, which is one of the oldest colleges at King Saud University and was the first scientific college in the Arabian Peninsula.

Chemistry program was established to provide the Kingdom with scientific leaders in the different sectors and to:

- Development of Chemical industries in the Kingdom.
- Serving the petroleum, petrochemical, pharmaceutical, mining, food, detergents and other Chemical industries.

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<sup>3</sup> EQF = The European Qualifications Framework for lifelong learning

- Preparing highly qualified chemists for research and development laboratories.
- Preparing leaders for kingdom sustainable development.
- Safety awareness on health hazards and proper use of Chemicals and environmental protection.
- Supporting lifelong learning ensuring continued intellectual growth and welfare of society.”

For the Bachelor’s degree program Biochemistry the institution has presented the following profile in the self-assessment report:

„Biochemistry is a multidiscipline field of science that deals with living systems of all organisms, and thereby, intertwines with many versatile disciplines such as: medicine, pharmacy, chemistry, zoology, botany, microbiology, and agriculture and even computer science. The Biochemistry program has always tried to establish ties with industry and/or professional groups, mostly to improve the employment prospects of our graduates. The program communicates, through the Head or faculties with representatives from industry, government agencies and academia to advise the program on current trends and requirement.“

For the Bachelor degree programs Microbiology and Botany the institution has presented the following profile in the program Handbook:

„The Department of Botany and Microbiology is an educational institution and research responsible for the development and publication of knowledge in different areas of plant science and microbiology. The Department of Botany and Microbiology provides excellent opportunities for higher education in accordance with high academic standards in all areas of knowledge related to plant science and microbiology. Its efforts are aimed at all levels of interested Saudis and others to contribute to their qualification to participate in the comprehensive development through their various roles such as the General education in the Ministry of Education, Higher Education, the Saudi universities, the Ministry of Health, the Ministry of Agriculture, the Ministry of Water and Electricity, the Ministry of Trade and Industry, the General Authority for Standardization, the General Authority for Metrology and Environment Protection, the National Commission for Wildlife Conservation and Development, and various private institutions. The Department works on the continuous development of knowledge through scientific research to provide practical solutions and specialized professional advice to institutions dealing with services, productivity and develop-

## **B Characteristics of the Degree Programmes**

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ment processes to help them perform their duties in the overall development. The Department is also interested in raising intellectual and cultural awareness of the community and the protection of the environment.”

Mission of the College of Science:

To offer study programs and developed research projects capable of providing society with knowledge and trained personnel through a stimulating environment for learning, creativity and scientific research with continuing quality to ensure optimal use of technology and general partnership.”

## C Peer Report for the ASIIN Seal

### 1. The Degree Programme: Concept, content & implementation

<b>Criterion 1.1 Objectives and learning outcomes of a degree programme (intended qualifications profile)</b>
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**Evidence:**

- Objectives and intended learning outcomes for the study programs are accessible to students and other stakeholders in the student handbook and the Program Specifications.
- Occupation opportunities are listed in the program handbook on page 7 for BSc. Botany and BSc. Microbiology
- Website of the Bachelor programme in Chemistry: <https://sciences.ksu.edu.sa/en/node/829> (accessed on 18 December 2017)
- Website of the Bachelor programme in Biochemistry: <https://sciences.ksu.edu.sa/en/node/861> (accessed on 18 December 2017)
- Discussion during the on-site visit

**Preliminary assessment and analysis of the peers:**

The objectives and learning outcomes of the respective programmes were analysed by the peers on the basis of more or less detailed descriptions in the self-assessment reports as well as several attachments such as study plans and handbooks. Programme objectives are also presented for the programmes in Chemistry and Biochemistry on the respective websites. Thus, the peers were able to gather all relevant information but indicated that programme objectives should be presented in English language in a more homogenous form on the websites of all degree programmes.

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 Committees of Chemistry and Life Sciences 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:

According to the website, the students of the Bachelor programme in Chemistry gain basic knowledge in the concepts and basic theory of chemistry. All students in the four programmes under review additionally have to pass an introductory year in which they are acquainted with basic knowledge in mathematics and natural sciences. Further, graduates of the programmes should be able to work in laboratories independently adhering to the necessary safety regulations. They shall have the skill to conduct chemical reactions and to prepare and identify chemicals. Generally, they should be able to present the results of their scientific research activities, work in teams and to continue their learning in a life-long process in order to keep up-to-date with professional developments. They are aware of sustainable developments in their field and their responsibility for negative impacts on the environment. They acquire competences in academic writing and are thus prepared to continue their studies on a Master level.

Further, the following occupations after graduation are aimed for: administrator, laboratory technician or research assistant (Ministry of Education); highschool teacher, laboratory expert (Ministry of Education/ Ministry of Interior and National Guard); expert in quality labs: Saudi Standards, Metrology and Quality Organization; Expert in quality labs (Food & Drug Administration ); Researcher and Technician (King Abdul-Aziz City for Science and Technology); Chemical and petrochemical industries; Chemists in Government and private sectors; Candidates to be academic staff; Researcher in research laboratories; Working in medical laboratories.

In the Bachelor programme of Biochemistry students gain "in-depth knowledge of basic biochemistry principles together with a clear understanding of interdisciplinary areas such as molecular biology, immunology, toxicology, biotechnology and human nutrition". They are enabled to critical thinking in the performance, design, interpretation and documentation of laboratory experiments and can interpret and present data, using appropriate qualitative and quantitative techniques. Being aware of professional and scientific ethics related to the field they possess the necessary skills to independently research, describe and analyse in reading and writing and to present their research results to a public audience. All this they can do on their own but also in teams through their advanced communicative competences. After graduating the students can be employed in industry or continue their studies on Master level.

Furthermore the aims for following occupations are defined: Working at Saudi Food and Drug Authority; Working in the laboratories of medical tests; The laboratories of the Ministry of Defense, the National Guard, and King Abdul-Aziz City for Science and Technology; The Ministry of Health allows graduates to open laboratories for medical tests; Working as lecturers or researchers in various universities; Teaching at various levels of public education; The Ministry of Higher Education; The Ministry of Education; The Ministry of Health; The Ministry of Agriculture; The Ministry of Commerce and industry.

The Bachelor programme of Microbiology pursues the goal to convey the basic principles of Natural Sciences and Mathematics, Microbiological Sciences (Taxonomy, Physiology, Pathology, Genetics, etc.) as well as the basics of biotechnology used for the diagnosis of molecular and cellular diseases. Students are enabled to do research on their own and in groups, document their findings and to publicly present the results. Graduates are competent to work in chemical, clinical and biological labs, where they can independently carry out experiments being aware of the required safety regulations. Through their acquired skills in data statistical analysis and scientific essay writing they are able to choose after graduation to work in industry or to continue their studies on a Master level.

The following possible ministries or institutions where the alumni have job opportunities are listed in the program handbook: The Ministry of Education - Saudi universities, King Abdul Aziz City for Science and Technology, Ministry of Agriculture and its affiliated institutes, Medical laboratories, The Saudi Arabian Standards Organization, Saudi Food and Drug Administration (SFDA), The General Presidency of Meteorology and Environment Protection, The Grain and Flour Mill Organization (GSFMO), Ministry of Electricity and Water, The Ministry of Education, Wild Life Saudi Commission, Research centers and laboratories, Ministry of Defense and Aviation

Students of the Bachelor programme of Botany are also being acquainted with the basic principles of Mathematics and Natural Sciences during their preparatory year. Further, students gain a sound knowledge of the fundamentals of Botany and molecular, cell and organismic biology. Students should gain methodological competence in botany and should be able to apply this in other contexts. Moreover students gain the capabilities to do practical work in labs and outdoors as well as handle organisms. Furthermore, they gain relevant knowledge of safety and environmental issues as well as the associated legal fundamentals. Further, they should be able to recognise relevant problems in the area of Botany, solve them and present the results. They can communicate effectively through written reports, in team work or public discussions and presentations and develop life-long learning skills which also enable them to continue their research on the level of a Master programme.

The following possible ministries or institutions where the alumni have job opportunities are listed in the program handbook: The Ministry of Education - Saudi universities, King Abdul Aziz City for Science and Technology, Ministry of Agriculture and its affiliated institutes, Tissue culture laboratories, The Saudi Arabian Standards Organization, Saudi Food and Drug Administration (SFDA), The General Presidency of Meteorology and Environment Protection, The Grain and Flour Mill Organization (GFMO), Commercial production of plants, The Ministry of Education, Wild Life Saudi Commission, Research centers and laboratories.

The auditors state, that the objectives and learning outcomes of the degree programmes including the objectives for job opportunities are described clearly. Nevertheless, despite the precise descriptions concerning aspect of individual research and critical thinking the panel did realize that the implementation in the curricula and respective modules still leaves room for improvement. Thus, the transition from description to practice needs to be ensured which will be discussed under criterion 1.3.

The peers conclude that the Subject-Specific Criteria of Chemistry and Life Sciences are overall covered in the learning objectives of all four degree programmes under review. The auditors especially compliment the University for analysing the objectives and learning outcomes on a regular basis, which was seen in the reports from a large amount of collected data.

Overall the intended qualifications profile seems to allow the students to take up an occupation which corresponds to their qualification. The auditors recognized the difficulties of females to work in the industry that follow cultural differences. Nevertheless, the peers recommend to keep up efforts for closer cooperation with the industry and strengthen internship and excursion opportunities to enhance the students' interests and knowledge of opportunities in these branches.

The auditors saw that overall the relevant stakeholders were included in the process of formulating and further developing the objectives and learning outcomes. However, it is recommended that students, alumni and stakeholders from the industry become more involved in these processes.

<b>Criterion 1.2 Name of the degree programme</b>
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**Evidence:**

- The names of the bachelor programs are defined in the self-study reports and several other documents provided by the University

**Preliminary assessment and analysis of the peers:**

The auditors consider the titles of the four reviewed bachelor programmes as adequate to reflect the intended aims and learning outcomes as well as, fundamentally, the main course language.

<b>Criterion 1.3 Curriculum</b>
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**Evidence:**

- Download-platform for pdf study plans of all Bachelor degree programmes (accessed 02<sup>nd</sup> January 2018): <https://sciences.ksu.edu.sa/en/node/1101>

**Preliminary assessment and analysis of the peers:**

The **curriculum of the Bachelor's program Chemistry** is composed of nine mandatory modules in the first (preparatory) year, comprising 31 Saudi Arabian credit points: English Language I and II; Mathematics I (Introduction) and II (Calculus & Integration); Computer skills; Research, thinking and learning skills; Health & Fitness; Communication skills; Entrepreneurship.

The second year is composed of 12 modules comprising 35 Saudi Arabian credit points: General Chemistry I and II, Integration Calculus, General Physics II, Chemistry of Main Groups, Chemical thermodynamics, Organic Chemistry I, Identification of Organic Compounds, Volumetric and Gravimetric Analysis; as well as the following modules required by the university: Introduction to Islamic Culture and Islam and Building up the Society. Additionally the students choose one elective module.

The third year is composed of 18 modules comprising 36 Saudi Arabian credit points: Chemistry of Transition Elements, Phases of Substances and Solutions, Practical Physical Chemistry I, Organic Chemistry II, Spectroscopic Methods, Quantum Chemistry I, Inorganic Compounds Spectroscopy, Chemical Kinetics, Heterocyclic Organic Chemistry, Polymers and Petrochemicals, Electro-analytical Methods, as well as 3 mandatory-electives modules within the field of chemistry and 2 free elective modules (list of electives). Additionally, the students choose the modules Economic System in Islam; Fundamentals of Islamic Policies, which are required by the university.

The fourth year is composed of 16 modules comprising 34 Saudi Arabian credit points: Chemistry of Solid State, Chemistry of Interfacial Surfaces, Practical Physical Chemistry II, Organic Compounds Spectroscopy, Training on Chemical Instrument, Organometallic Chemistry, Chemical Separation and Chromatographic Methods, Research Project, as well

as 5 mandatory-elective modules within the field of chemistry, one mandatory elective and 2 free elective modules.

Elective modules are the following: Non-aqueous Chemistry, Lanthanides and Actinides, Quantum Chemistry II, Physical Chemistry of Polymers, Industrial Chemistry, Nuclear and Radiation Chemistry, Theoretical Chemistry, Organic Reaction Mechanism, Practical Applications of Organic Chemistry, Inorganic Reaction Mechanism, Bio-inorganic Chemistry, Industrial-inorganic Chemistry, Practical Inorganic Chemistry II, Corrosion, Surface Chemistry and Catalysis, Organic Industries, Chemistry of Natural Products, Advanced Practical Organic Chemistry, Statistical Treatment of Chemical Data, Environmental Analysis, Medical and Industrial Analysis.

The **curriculum of the Bachelor's program Biochemistry** is also composed of the nine mandatory modules in the first (preparatory) year, comprising 31 Saudi Arabian credit points: English Language I and II; Mathematics I (Introduction) and II (Calculus & Integration); Computer skills; Research, thinking and learning skills; Health & Fitness; Communication skills; Entrepreneurship.

The second year is composed of 8 mandatory modules comprising 25 Saudi Arabian credit points: General Chemistry I, Principles of general Zoology, Biostatistics, Microbiology, General Physics II, Introduction in Organic Chemistry, General Biochemistry I, Chemical Thermodynamic.

The third year is composed of 11 mandatory modules comprising 32 Saudi Arabian credit points: Analytical Chemistry, General Biochemistry II, Biochemical Calculations, Enzymes, Experiments in Enzymology, Heterocyclic Organic Chemistry, Biophysical Biochemistry, Experiments in Biophysical Biochemistry, Metabolism I, Molecular Biology and Biochemistry of Blood.

The fourth year is composed of 10 mandatory modules comprising 26 Saudi Arabian credit points: Metabolism II, Practical Metabolism, Biomembranes and Cell Signalling, Biotechnology & Genetic engineering, Training in the Principles and Scientific Research skills, Nutritional Biochemistry, Hormones, Bioinformatics, Immunology and Research and Seminar.

Furthermore there are 3 kinds of elective modules wherein each module gives 2-3 credit points: The first group (GI) include courses that are required by the King Saud University and the student has to select 8 credit hours: Studies in Prophet Seerah, Fundamentals of Islamic Culture, Family in Islam, Islamic economy, Islamic politics, Human Rights, Medical Jurisprudence, Ethics, Current topics and Women & her role in Improvement. The second group (GII) includes courses that are required by the College of Sciences and the student

has to select 5 credit hours: Principles of Genetics, Medical Virology and Medical Bacteriology. The third group (GIII) includes courses that are required by the BSc. Biochemistry program and the student has to select 9 credit hours: Cellular Biochemistry, Biophysics, Bioenergetics, Biochemistry of Specialized Tissues, Biochemistry of Biological Fluids, Biomarkers in Health & Diseases, Nanotechnology, Toxicology & Carcinogens, Gene Expression, Biochemical Genetics and Molecular Biology of Cancer.

The **curriculum of the Bachelor's program Microbiology** is also composed of the nine mandatory modules in the first (preparatory) year, comprising 31 Saudi Arabian credit points: English Language I and II; Mathematics I (Introduction) and II (Calculus & Integration); Computer skills; Research, thinking and learning skills; Health & Fitness; Communication skills; Entrepreneurship.

The second year is composed of 8 mandatory modules comprising 31 Saudi Arabian credit points: General Chemistry I, General Biochemistry, General Microbiology, Biostatistics, Laboratory Skill, General Virology, General Bacteriology and General Mycology; as well as 2 elective courses required by the university. Additionally, the student can choose one free elective course.

The third year is composed of 10 mandatory modules comprising 33 Saudi Arabian credit points: Biology of Microalgae, Food Microbiology, Microbial Physiology, Microbial Ecology & Pollution, Microbial Diagnosis, Biochemical Instrumentation, Sanitation and Water Microbiology, Microbial Genetics, Microbial fine structure and industrial microbiology; as well as 2 elective courses from outside specialization and 2 elective courses from university requirement.

Between the third and fourth year the students have the possibility to do a summer semester comprising training in the techniques of food microbes, environmental and human health which awards 5 credit points.

The fourth year is composed of 8 mandatory courses comprising 36 Saudi Arabian credit points: Introduction to Petroleum, Immunology, Medical Virology, Medical Bacteriology, Medical Mycology, Scientific Communication, Research Project and Training in medical microbiology laboratories. Additionally, the students must choose 6 elective courses from their specialization.

The elective courses required by the university include: Studies in Prophet Seerah, Fundamentals of Islamic Culture, Family in Islam, Islamic economy, Islamic politics, Human Rights, Medical Jurisprudence, Ethics, Current topics and Women & her role in Improvement. Elective courses from outside the specialization are: Botany, Principal of general zoology, Or-

ganic Chemistry, Biophysics, Fundamental of Analytical Chemistry, Microtechniques. Elective courses within the specialization are: Molecular Biology, Biodegradation, Microbial Interactions, Mining Microbiology, Lichenology, Yeast, Antibiotics and Plankton.

The **curriculum of the Bachelor's program Botany** is composed of the nine mandatory modules in the first (preparatory) year, comprising 31 Saudi Arabian credit points: English Language I and II; Mathematics I (Introduction) and II (Calculus & Integration); Computer skills; Research, thinking and learning skills; Health & Fitness; Communication skills; Entrepreneurship.

The second year is composed of 9 mandatory courses comprising 35 Saudi Arabian credit points: Botany, Principals of Zoology, General Microbiology, Principals of Flowering Plants Taxonomy, General Chemistry I, Plant Anatomy, Microtechnique, Plant Ecological Factors, Plant physiology; as well as 2 elective courses that are required by the University. Additionally, the students have to choose one elective course from their specialization.

The third year is composed of 11 mandatory courses comprising 34 Saudi Arabian credit points: Cell Biology & Cytogenetic, Genetics, Flora of Saudi Arabia, Pollution and Environmental protection, Ecophysiology, Biostatistic, Plant Growth and its regulators, Phycology, Plant Communities, Hot Desert Ecology, Pharmagonosy I; as well as 2 elective courses that are required by the University. Additionally, the students have to choose 2 elective courses from their specialization.

Between the third and fourth year the students have the possibility to do a summer semester consisting of a training of monitoring of plants and algae which comprises 5 credit points.

The fourth year is composed of 9 mandatory courses comprising 31 Saudi Arabian credit points: General Biophysics I, Principles of Remote Sensing in Geography, Ecological Resources, Research Project, Industry & Environment, Plant Molecular biology, Population Genetics, Plant Tissue Culture, Plant Chemistry; as well as 4 elective courses from 1<sup>st</sup> or 2<sup>nd</sup> group.

Elective courses that are required by the University are the same as above. Elective courses from the specialization are the following: Archegoniates, Plant Morphogenesis, Experimental Taxonomy, Seminar, Ecosystems, Plant Geography, Metabolism & Transport in Plants, Plant Water & Soil Relations, Management of Botany natural resources, Arid regions development, Gene Conservation, Genetic Engineering, Ecological Genetics, Date Palm Biology, Phytoplanktons. Elective courses from outside the specialization are group A microbiology group: Laboratory Skills, General Virology, Molecular Biology, General Bacteriology,

General Mycology, Microbial Physiology, W. & S. Microbiology, Antibiotics, Industrial Microbiology; or group B Biology group: Parasitology, General Entomology, Ichthyology, Amphibians & Reptiles, Ornithology, Mammology, Land Ecology, Aquatic Ecology, Endocrinology, Geoecology.

A Bachelor's project (so-called research project) concludes the **four degree programs**. For these projects 3 Saudi Arabian credit points are awarded. The module Bachelor's project comprises a practical and a theoretical course: in the practical course experiments have to be completed in the course of one semester; even though these are often "standard" experiments (rather than research on novel aspects in the field), they have not been included in the previous courses. On this basis, a small research work cycle is completed including literature search, the experiment as such, as well as analysis and comparison of the results. Besides the written report, the results are also published on a poster. The theoretical course includes a mini review of an article, an oral exam and a power point presentation.

In conclusion, the auditors found that the curricula of the **four degree programmes** in principle reflect the intended learning outcomes. The peers compliment the university with regards to the chances for the students to collect international experiences and go abroad within the summer program, the possibility that is given the students to look into different industries on several days during their studies, and the voluntary English clubs that have been established.

They positively noted that students have the opportunities to work with a wide range of equipment and seem to be familiar with the usage of it. Nevertheless, they found that theoretical aspects are still slightly overrepresented in the four programs and they recommend to strengthen the efforts of introducing more project-oriented practical work into the curriculum, so that it better corresponds to the practical skills and experience needed in order to be competitive in the international context.

In the previous report the auditors suggested that some elective modules on organic and inorganic synthesis "[Practical Applications of Organic Chemistry, Advanced Practical Organic Chemistry as well as Practical Inorganic Chemistry]" should be reintroduced as mandatory modules, because in their opinion basic knowledge of and experience in organic and inorganic synthesis is a highly desirable learning outcome for all chemistry graduates. The auditors share this opinion but found that these 3 modules are still elective modules. Thus, they recommend once again to make them mandatory.

When sighting the samples of final projects the quality of the research project papers differed very much. The auditors recommend that efforts should be made in terms of a larger volume and standardized appearance of the papers. With view to the intended international competitiveness of the graduates and to strengthening the scientific approach of



those graduates pursuing their studies at Master's level, the auditors strongly recommended that even more emphasis should be laid on research aspects in the Bachelor's project. For the same reason they recommended that teaching at Bachelor's level should, wherever possible, be interlinked with research. The auditors found that some final project topics are being assigned to several students at a time. They strongly recommend that individual final project topics are worked on individually by all students of the four study programs as it provides the students with a way to prove their independent research competence and better international comparability.

#### Criterion 1.4 Admission requirements

##### **Evidence:**

- Self-Assessment Reports Chemistry, Biochemistry, Microbiology and Botany
- Admission website (is only available in Arabic; accessed 03.01.2018): <http://dar.ksu.edu.sa/en/e-admission>
- New Student Guide Book of King Saud University (annexed to the self-assessment report)
- Program Handbooks
- Discussions with management, teaching staff and students

##### **Preliminary assessment and analysis of the peers:**

The admission requirements for the programs are made transparent in the program 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 program. 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 the degree programs differ. The students can indicate three wishes which program they actually want to study and depending on the GPA they are allocated to the different programs. The panel was informed that activities such as job fair and information day are regularly held during the preparatory year in order to inform the students about the opportunities they have with the respective subjects. Nevertheless, the peers got the impression, that the cooperation to the industry and alumni could still be improved. The peers see the necessity that enterprises and program coordinators should work more

closely together thus outlining job opportunities and interesting fields of research. The peers also welcome the fact that the preparatory year will in future be more subject-oriented thus allowing for more subject-specific information that can be conveyed already during the first year.

In summary, the auditors confirm that the requirements and procedures for admission for all programs are transparent and clear. All applicants are treated according to the same standards and regulations.

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

Since the HEI did not further comment on the report the peers consider the criterion to be partly fulfilled.

## **2. The degree programme: structures, methods and implementation**

### **Criterion 2.1 Structure and modules**

**Evidence:**

- Self-Assessment Reports Botany, Biochemistry, Chemistry and Microbiology
- Download-platform for pdf study plans of all Bachelor degree programmes (accessed 02<sup>nd</sup> January 2018): <https://sciences.ksu.edu.sa/en/node/1101>
- Programme Handbooks, 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 3 credit points (with some few exceptions). The modules offered are completed by students of the degree programs, but also by students from other degree programs. Some modules offered in the degree programs discussed are imported from other departments. 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.

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.

Reviewing the final project papers the auditors found that the quality differed very much in terms of structure, volume, project topics and depth of study. They therefore strongly recommend to have more unified standards regarding the final projects across the four study programs or departments. From what they have seen on-site regarding the module descriptions of the four study programs, they also recommend to better standardize the module descriptions across the departments.

#### *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 emphasised in the Master's and PhD programmes. Although there was some interest of the Bachelor students during the interviews on-site in going abroad and few of the alumni stated that they did their studies abroad, the peers got the impression that the students' interest and knowledge about international exchange could be enhanced and international partnerships could be strengthened.

#### *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.

<b>Criterion 2.2 Work load and credits</b>
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#### **Evidence:**

- Self-Assessment Reports Botany, Biochemistry, Chemistry and Microbiology
- Discussions with students and teaching staff during onsite visit

#### **Preliminary assessment and analysis of the peers:**

The Bachelor's programs have a credit point system in place. As a rule, the modules are weighted with 2 to 4 Saudi Arabian credit points. One credit point is awarded for 1 hour of lectures or 2 hours of tutorial or lab. Between 15 and 19 credit points are awarded per semester. The Bachelor's project is weighted with 3 Saudi Arabian credit points. According to the last ASIIN report and to the program coordinators, the allocation of credit points to

individual modules is based on experiences from previous degree programs. During the site-visit the program coordinators explained, that the number of credit points awarded for the Bachelor's Project does not reflect the actual workload invested by the students to complete the module. On average students work on their projects for 16 hours per week during one semester. The program coordinators explained that the calculation of credit points for the Bachelor's project is university-wide oriented at the number of weekly contact hours per semester (3). The award of credit points is furthermore limited by the maximum overall number of 136 credits per degree program.

As the credit point system used in Saudi Arabia only encompasses the presence hours and not additional students' self-study, the auditors did not find the system comparable to the ECTS system (European Credit Transfer System), as also already considered in the previous ASIIN report. Since the course descriptions already contain indications about the expected weekly self-study time, they assumed the university capable of making a comparison of their credit point system to the ECTS system. They judged this helpful for those graduates wishing to pursue further studies at a university in the European Higher education Area. Particularly, the auditors (still) think that the weight, level and scope of the final project (graduation thesis) are not properly reflected by the credit points awarded.

The auditors furthermore noted that the language in which the courses are taught is not reflected in the module descriptions and recommend to add this information. During the site-visit the auditors considered the students' level of English very positively. Nevertheless, they recommend to keep up efforts to further enhance English as well as communication and presentation skills in the modules since these are internationally most important aspects.

In order to allow for international competitiveness of the four reviewed degree programs, the audit team found that the actual workload (contact hours + independent study hours) invested by the students for completing the Bachelor's project and their studies in general, should be made transparent to external stakeholders. Thus, the so-called Diploma Supplement will raise the international awareness of the actual level of the program if third parties can assess the amount of work invested in the respective tasks (see criterion 5.2).

<b>Criterion 2.3 Teaching methodology</b>
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**Evidence:**

- Last ASIIN report
- The module descriptions give information about the used teaching methods.

- Interviews during the on-site visit

**Preliminary assessment and analysis of the peers:**

The didactical concept includes the following elements: Traditional classroom, blended learning (traditional and online), e-learning, correspondence and other (i.e. lab work). Groups are normally made up of usually no more than 40-45 students for lectures and 20-25 students for labs. Usually, two or three students jointly complete an experiment, three staff members are present during the lab session (lecturer, technician/assistant, demonstrator). Generally all courses of the Bachelor's programs are taught by female staff at the female campus. For certain exceptions within the electives, but particularly for the subsequent degrees, courses by male professors are attended via video-conferencing.

In conclusion, the auditors gained the impression that the teaching methods used for implementing the didactical concept are appropriate to support the attainment of the learning objectives.

In order to be competitive in the international context the auditors recommend to strengthen the students' ability to work independently and train their independent research competence. A way to accomplish this within the modules could be through firstly letting the students do more oral exams. Another way would be to include more oral presentations into the modules. During the on-site visit the students explained that they do oral presentations in some courses but would like to have more of them. The auditors therefore recommend to augment oral presentations within the course modules of the reviewed degree programs.

<b>Criterion 2.4 Support and assistance</b>
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**Evidence:**

- Self-reports of the University
- Interviews during the on-site visit
- Previous accreditation report

**Preliminary assessment and analysis of the peers:**

The individual student support and –counselling is, according to the applicant HEI, guaranteed by the following persons and regulations: All members of the teaching staff provide educational advice during their office hours (some of them 2 hours per day). Additionally, the Student Guidance Committee and the Deanship of Academic Affairs are responsible for counselling students. Students who have failed a course are obliged to make use of specific additional assistance. Regular student surveys and evaluations on the quality of the student

counselling are conducted. According to the survey evaluations in the university self-reports overall the students are satisfied with the student counselling.

In conclusion, the audit team saw sufficient resources to guarantee support and counselling for students. The auditors gained the impression that both the staff and the students are very highly engaged in the activities and that good relationships existed between students and staff. The team positively acknowledged the responsiveness of teaching staff towards students' needs, which is not least reflected by the mentioned two office hours per day. The students mentioned that they would like to have more support from teaching staff to more easily enter the Master program. The auditors therefore recommend to find ways for the staff supporting the students more in this regard.

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

Since the HEI did not further comment on the report the peers consider the criterion to be predominantly fulfilled.

### 3. Exams: System, concept and organization

<b>Criterion 3 Exams: System, concept and organization</b>
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**Evidence:**

- The module descriptions give information about the exam types, number of exams and the proportion of each exam in the overall grade.

**Preliminary assessment and analysis of the peers:**

In the different modules the following types of exams are usually envisaged: Quizzes and home-work (also through electronic devices), written mid-term and written final exams, seminar and project discussions, practical lab exam, and practical reports. As a rule, the graduation project includes a mandatory colloquium, normally including a presentation.

Failed exams cannot be repeated without repeating the whole module, but the number of their repetitions is unlimited. Students can drop a course if they feel they cannot pass the final exam. Modules are offered each semester, all electives are offered at least once per year (the minimum groups size for electives is five). Depending on the grade point average reached in the previous semester, students are allowed to take more or less courses. The program coordinators explained that this rule helps to give students who have failed an exam more time to study.

Exams are organized as follows: 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 for students who could not attend the mid-term exams due to illness are held one week before the final exams.

Grades for each module are calculated on a specific basis detailed in the course description, depending on the number of exams taken. The grade point average per semester or for the whole program is calculated taking into account the credits for each module.

The auditors gained the impression that in principle the chosen exam types are oriented at the learning objectives defined for the individual modules.

The auditors positively noted that compared to the previous program review there are more presentations and practical exams included into the modules. Since the students proposed that they wanted more presentations during class, the auditors recommend to consider whether more oral presentations could be incorporated into the modules.

Not mentioned in the module descriptions are the duration of the exams. The auditors recommend to add this information in the module descriptions.

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

Since the HEI did not further comment on the report the peers consider the criterion to be predominantly fulfilled.

## 4. Resources

<b>Criterion 4.1 Staff</b>
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**Evidence:**

- The self-reports list the teaching staff of the BSc. Chemistry, BSc. Biochemistry and the BSc. Microbiology and show the qualification of the teaching staff.
- Interviews during the site-visit confirmed the high qualification of the teaching staff.

**Preliminary assessment and analysis of the peers:**

The teaching staff of the **Chemistry program** at the female campus is composed of 26 professors, associate professors and assistant professors and 14 lecturers, teaching assistants and practical preceptors. Not included in the numbers are technicians and laboratory assistants. Out of the total of 40 persons 26 hold a PhD, 9 a Master's degree and 5 a Bachelor. The average credit workload per teaching staff in the first semester is 10, in the second

10.9. The average class enrolment in the first semester is 25 students and in the second 23 students.

The staff of the **Biochemistry program** is composed of 3 professors, 4 associate professors, 7 assistant professors, 12 lecturers, 10 demonstrators, 2 researchers and assistant researchers and 7 technicians and administrative staff. The university states in the self-report, that all instructors in the program are full time instructors and have a minimum of Ph.D. degree in Biochemistry. The university also states that 90% of the teaching staff has more than 5 years of teaching experience and are involved in research activities.

The teaching staff of the **Microbiology program** is composed of 1 professor, 3 associate professors, 14 assistant professors and 10 lecturers. All of them are full time employed. The professors, associate professors and assistant professors have all PhDs and the lecturers have Master of Science degrees.

The annex table listing the teaching staff of the **Botany program** could not be found in the documents the university provided. However the university states in the self-report, that all instructors in the program are full time instructors and have a minimum of Ph.D. degree in Botany.

The teaching load of full professors is 10 hours per week, for associate professors 12, for assistant professors 14, and 16 for lecturers.

In conclusion, the auditors found the composition, scientific orientation and qualification of the teaching staff in principle to be suitable for sustaining the degree programs. Conversations in English were unproblematic with all the teaching staff during the interviews and confirmed the high qualification of the present staff.

The interviews at site showed that the students feel very well supported by the teaching staff and that the motivation of students and teachers is very high.

During the site visits the auditors noted that there is a higher teaching load ratio at the female campus than at the male campus. They were told that this is also due to some teaching staff being abroad and other temporary reasons. The peers judge the staff resources as temporarily sufficient. In the long-term however there should be a decrease in teaching load ratio at the female campus. The auditors argue that a lower teaching load ratio would also give room for needed research and opportunities for sabbatical years abroad in order to further augment the qualification of the teaching staff. The auditors also recommend keeping up efforts with regards to acquiring more supporting staff.

<b>Criterion 4.2 Staff development</b>
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**Evidence:**

- Self-report and interviews on-site

**Preliminary assessment and analysis of the peers:**

The teaching staff members have the opportunity to participate in the following schemes for staff development: A Specific deanship is in charge of staff skills development. New faculty members are required to participate in two weeklong workshops. All staff members are encouraged to attend workshops for improving their skills in communication, teaching, learning, assessment, new computers, E-learning etc. Furthermore, regular evaluations of the teaching staff are conducted.

While it is not a requirement to participate, attended workshops and evaluation results will be taken into consideration for promotion or attendance of international conferences.

In conclusion, the auditors found that all of the teaching staff have adequate possibilities to develop and train their didactic and professional skills. It was positively acknowledged that the existing possibilities are widely used among the teaching staff, that the teaching staff seems very open to include modern tools in order to enhance student-teacher interaction in the courses and that there are possibilities for the teaching staff to visit each other's courses in order to provide feedback to each other. The regular evaluations and feedbacks of the results are also seen very positively by the auditors. During the site visit the auditors recommended to open up the teaching staff evaluation results and make it accessible for all teachers in order to foster an even better staff development and comparability. This idea seemed to meet consent among the present teaching staff.

<b>Criterion 4.3 Funds and equipment</b>
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**Evidence:**

- Self-reports of the University
- Interviews during the site-visit

**Preliminary assessment and analysis of the peers:**

In the self-report the university states that the key indicators for the equipment are the following: 1 - College's classrooms and laboratories readiness faculty survey; 2 - Students rating through surveys of the classroom's facilities effectiveness; 3 - Number of accessible computer terminal per students and 4- Internet bandwidth per user.

Regular student and faculty member surveys on the equipment are being conducted, results are evaluated and next action steps are listed.

Overall the auditors judged the funds and equipment for the four degree programs as very satisfactory.

During the site visit the auditors were impressed by the new female campus building and the wide-range, high-technology equipment. They learned that compared to the visit seven years ago the females now have their own laboratories which are equipped very well and their own library which can be accessed from the morning until 5 pm. If the teaching staff or the students want to have access to the laboratories after 5 pm they have to apply for a special permission. The opening hours were identified by the auditors as a room for improvement, so that access can be granted without special permission also after 5 pm and become more flexible. The auditors also mentioned during the site visit that PhD students could be in charge of the laboratory machines one for each machine. That way there would be always someone responsible for each machine who can be contacted easily. Overall the safety measures in the laboratories were judged by the peers as very well. However, it must be taken care that gas bottles are not being placed freely in the laboratories but are secured safely.

Moreover the auditors were impressed by the facilities for disabled persons especially in the female library.

Finally all auditors agreed that the financial situation for the university overall and the four reviewed degree programs exceeds the standard in European universities. Students and teaching staff have excellent funding possibilities for going abroad, doing a sabbatical year and more.

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

Since the HEI did not further comment on the report the peers consider the criterion to be partly fulfilled.

## 5. Transparency and documentation

### Criterion 5.1 Module descriptions

**Evidence:**

- Course descriptions as part of the Self-Assessment Reports of Botany, Biochemistry, Chemistry and Microbiology
- Course Descriptions online (accessed 4th January 2018):
  - Biochemistry: <http://sciences.ksu.edu.sa/en/node/865>

- Botany: [https://sciences.ksu.edu.sa/sites/sciences.ksu.edu.sa/files/attach/botany\\_program.pdf](https://sciences.ksu.edu.sa/sites/sciences.ksu.edu.sa/files/attach/botany_program.pdf)
- Chemistry: [http://sciences.ksu.edu.sa/sites/sciences.ksu.edu.sa/files/imce\\_images/courses\\_description.pdf](http://sciences.ksu.edu.sa/sites/sciences.ksu.edu.sa/files/imce_images/courses_description.pdf)
- Microbiology: [https://sciences.ksu.edu.sa/sites/sciences.ksu.edu.sa/files/attach/mbio\\_program-2-13.pdf](https://sciences.ksu.edu.sa/sites/sciences.ksu.edu.sa/files/attach/mbio_program-2-13.pdf)

**Preliminary assessment and analysis of the peers:**

The peers positively noticed that short module descriptions for all programmes under review were accessible online in English language and more detailed descriptions are sometimes being provided in the programme handbook. Especially in the case of the Chemistry programmes the panel found a laudable example of improvement with precise descriptions of learning outcomes and all required information. Further, the peers understood from the discussion with teachers and students that detailed information about the course content and examination procedures are being made accessible to the students at the beginning of each semester. Nevertheless, it would seem recommendable to generally present the module descriptions in a more homogenous way following the Chemistry example. Thus, in some cases the descriptions are still quite rudimentary not comprising any information on recommended literature, preconditions to take the course, the module responsible, the examination forms or even the number of awarded credits. These information are absolutely necessary to be presented in a concise and unified way to all stakeholders on the website in order to achieve greater transparency.

<b>Criterion 5.2 Diploma and Diploma Supplement</b>
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**Evidence:**

- Missing
- Teaching staff confirmed that there are no Diploma Supplements available for any of the reviewed study programs

**Preliminary assessment and analysis of the peers:**

The institution does not provide for the award of a Diploma Supplement as it was already the case in the previous review.

The peers insist that shortly after graduation the University should issue such a document together with the diploma in English language.

These documents should provide information on the student's qualifications profile and individual performance as well as the classification of the degree program with regard to its applicable education system.

The individual modules and the grading procedure on which the final mark is based should be explained in a way which is clear for third parties. In addition to the final mark, statistical data as set forth in the ECTS User's Guide could optimally be included to allow readers to categorize the individual result or degree.

#### 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:**

Since the HEI did not further comment on the report the peers consider the criterion to be partly 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 programs 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 programs are relevant to the daily teaching and learning activities. These surveys also include satisfaction with the provision of teaching and facilities and resources.

The students reported that they received feedback on their evaluations from the teachers individually. The peers note that there could be a more structured feedback loop to further develop the quality of the degree programs.

The auditors furthermore suggest that an organized alumni system could be very helpful to strengthen and develop more cooperation to graduates and the industry.

Through employer enhancement surveys and advisory meetings more effects could be achieved to make use of this information and contacts on programme level. The panel recommends 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:**

Since the HEI did not further comment on the report the peers consider the criterion to be predominantly fulfilled.

## **D Additional Documents**

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

None

## E Comment of the Higher Education Institution (27.02.2018)

The institution showed itself content with the report and did not present any further comments.

## F Summary: Peer recommendations (09.03.2018)

Taking into account the additional information and the comments given 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 Chemistry	With requirements for one year	n.a.	30.09.2024
Ba Biochemistry	With requirements for one year	n.a.	30.09.2024
Ba Microbiology	With requirements for one year	n.a.	30.09.2024
Ba Botany	With requirements for one year	n.a.	30.09.2024

### Requirements

- A 1. (ASIIN 5.2) Ensure that a Diploma Supplement is given to graduates which 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.
- A 2. (ASIIN 5.1) Ensure that the module descriptions are presented in a way so as to always include concise information about the responsible professor, recommended literature, examination forms and learning outcomes.

- A 3. (ASIIN 1.1) Ensure, that the educational objectives/learning outcomes of the programmes are published on the website in a way consistent with the programmes' presentation in the department handbooks.
- A 4. (ASIIN 4.3) Ensure that metal gas containers in the laboratories are safely installed.

### **Recommendations**

- E 1. (ASIIN 2.2; 3) It is recommended to clearly outline the student workload for the final project in order to achieve higher international compatibility. Further, a clear identification as an equivalent to the Bachelor thesis would be helpful.
- E 2. Regarding the final project, it is recommended to introduce standards in terms of individuality, volume and appearance of the final project papers on department level.
- E 3. (ASIIN 1.3) It is recommended to strengthen aspects of soft skills such as English language communication skills, economy and business leadership, and oral presentation competences in the curricula.
- E 4. (ASIIN 1.3; 1.4) It is recommended to further improve the communication between the departments and other stakeholders (industry) pointing out job opportunities and enhancing practical experiences (via internships or excursions).
- E 5. (ASIIN 1.3) It is strongly recommended that existing efforts of introducing more project-oriented practical (experimental) work into the curriculum so that it better corresponds to the practical skills and independent research competence needed
- E 6. (ASIIN 4.1) It is recommended to provide more support to the students in terms of more easily entering the Master program.
- E 7. (ASIIN 4.3) It is recommended to create more flexible opening hours of the laboratories.

### **For the Bachelor programme Chemistry:**

- E 8. (ASIIN 1.3) It is recommended to reintroduce the following elective modules on organic and inorganic synthesis as mandatory: Practical Applications of Organic Chemistry, Advanced Practical Organic Chemistry as well as Practical Inorganic Chemistry.



## G Comment of the Technical Committees

### Technical Committee 09 - Chemistry (07.03.2018)

*Assessment and analysis for the award of the ASIIN seal:*

The Technical Committee suggests harmonizing the requirements and recommendations for the female and male cluster procedure at King Saud University. For this reason, three additional recommendations are added, as they apply to both cluster.

Moreover, the former recommendation E1 is changed into a requirement, because the deficit appears to be essential. For the same reason an additional requirement A5 is issued.

Finally, the TC suggests a different wording for the recommendation E5.

The Technical Committee 09 – Chemistry recommends the award of the seals as follows:

Degree Programme	ASIIN seal	Subject-specific labels	Maximum duration of accreditation
Ba Botany	With requirements for one year	n.a.	30.09.2023
Ba Biochemistry	With requirements for one year	n.a.	30.09.2023
Ba Chemistry	With requirements for one year	n.a.	30.09.2025
Ba Microbiology	With requirements for one year	n.a.	30.09.2025

### Technical Committee 10 - Biology (16.03.2018)

*Assessment and analysis for the award of the ASIIN seal:*

The Technical Committee discusses the procedure and agrees with the modifications proposed by the TC 09.

The Technical Committee 10 – Life Sciences recommends the award of the seals as follows:

Degree Programme	ASIIN seal	Subject-specific labels	Maximum duration of accreditation
Ba Botany	With requirements for one year	n.a.	30.09.2023
Ba Biochemistry	With requirements for one year	n.a.	30.09.2023
Ba Chemistry	With requirements for one year	n.a.	30.09.2025
Ba Microbiology	With requirements for one year	n.a.	30.09.2025

## Requirements

### For all degree programmes

- A 1. (ASIIN 5.2) Ensure that a Diploma Supplement is given to graduates which 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.
- A 2. (ASIIN 5.1) Ensure that the module descriptions are presented in a way so as to always include concise information about the responsible professor, recommended literature, examination forms and learning outcomes.
- A 3. (ASIIN 1.1) Ensure, that the educational objectives/learning outcomes of the programmes are published on the website in a way consistent with the programmes' presentation in the department handbooks.
- A 4. (ASIIN 2.2; 3) Clearly outline the students' workload for the final project in order to achieve higher international compatibility. Furthermore, a clear identification as an equivalent to the Bachelor's thesis is necessary.
- A 5. (ASIIN 2.2) Ensure that the credits awarded for the modules correspond with the actual workload of the students.
- A 6. (ASIIN 4.3) Ensure that metal gas containers in the laboratories are safely installed.

## Recommendations

### For all degree programmes

- E 1. Regarding the final project, it is recommended to introduce standards in terms of individuality, volume and appearance of the final project papers on department level.
- E 2. (ASIIN 1.3) It is recommended to strengthen aspects of soft skills such as English language communication skills, economy and business leadership, and oral presentation competences in the curricula.
- E 3. (ASIIN 1.3; 1.4) It is recommended to further improve the communication between the departments and other stakeholders (industry) pointing out job opportunities and enhancing practical experiences (via internships or excursions).
- E 4. (ASIIN 1.3) It is strongly recommended that existing efforts of introducing more project-oriented practical (experimental) work into the curriculum so that it better corresponds to the practical skills and independent research competence needed.
- E 5. It is strongly recommended to introduce more project-oriented practical (experimental) work into the curriculum.
- E 6. (ASIIN 2.4) It is recommended to provide more support to the students in terms of more easily entering the Master program.
- E 7. (ASIIN 2.1) It is recommended to increase the number of bilateral cooperation agreements and to indicate a mobility windows in order to enhance the students' opportunities to study one semester abroad during the Bachelor programmes.
- E 8. (ASIIN 6) It is recommended to ensure that students get an institutionalised feedback about the evaluation results.
- E 9. (ASIIN 4.3) It is recommended to create more flexible opening hours of the laboratories.

### **For the Bachelor's degree programme Chemistry**

- E 10. (ASIIN 1.3) It is recommended to strengthen contents of homogenous and heterogeneous catalysis in the curriculum.
- E 11. (ASIIN 1.3) It is recommended to reintroduce the following elective modules on organic and inorganic synthesis as mandatory: Practical Applications of Organic Chemistry, Advanced Practical Organic Chemistry as well as Practical Inorganic Chemistry.

## H Decision of the Accreditation Commission (23.03.2018)

*Assessment and analysis for the award of the ASIIN seal:*

The Accreditation discusses the procedure and agrees to harmonize some of the requirements and recommendations for the female and male cluster procedure. Thus, the previous recommendation 4 is changed into requirement 4 and the new recommendations 6, 7 and 9 are newly introduced. These measures are considered necessary since both varieties are generally following the same programmes structure.

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

<b>Degree Programme</b>	<b>ASIIN seal</b>	<b>Subject-specific labels</b>	<b>Maximum duration of accreditation</b>
Ba Ba Botany	With requirements for one year	n.a.	30.09.2023
Ba Biochemistry	With requirements for one year	n.a.	30.09.2023
Ba Chemistry	With requirements for one year	n.a.	30.09.2025
Ba Microbiology	With requirements for one year	n.a.	30.09.2025

### Requirements

#### For all degree programmes

- A 1. (ASIIN 5.2) Ensure that a Diploma Supplement is provided to graduates containing 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.
- A 2. (ASIIN 5.1) Ensure that the module descriptions are presented in a way so as to always include concise information about the responsible professor, recommended literature, examination forms and learning outcomes.
- A 3. (ASIIN 1.1) Ensure, that the educational objectives/learning outcomes of the programmes are published on the website in a way consistent with the programmes' presentation in the department handbooks.

- A 4. (ASIIN 2.2; 3) Clearly outline the students' workload for the final project in order to achieve higher international compatibility. Furthermore, a clear identification as an equivalent to the Bachelor's thesis is necessary.
- A 5. (ASIIN 2.2) Ensure that the credits awarded for the modules correspond with the actual workload of the students.
- A 6. (ASIIN 4.3) Ensure that metal gas containers in the laboratories are safely installed.

### **Recommendations**

#### **For all degree programmes**

- E 1. Regarding the final project, it is recommended to introduce standards in terms of individuality, volume and appearance of the final project papers on department level.
- E 2. (ASIIN 1.3) It is recommended to strengthen aspects of soft skills such as English language communication skills, economy and business leadership, and oral presentation competences in the curricula.
- E 3. (ASIIN 1.3; 1.4) It is recommended to further improve the communication between the departments and other stakeholders (industry) pointing out job opportunities and enhancing practical experiences (via internships or excursions).
- E 4. (ASIIN 1.3) It is strongly recommended that existing efforts of introducing more project-oriented practical (experimental) work into the curriculum so that it better corresponds to the practical skills and independent research competence needed.
- E 5. (ASIIN 2.4) It is recommended to provide more support to the students in terms of more easily entering the Master program.
- E 6. (ASIIN 2.1) It is recommended to increase the number of bilateral cooperation agreements and to indicate a mobility windows in order to enhance the students' opportunities to study one semester abroad during the Bachelor programmes.
- E 7. (ASIIN 6) It is recommended to ensure that students get an institutionalised feedback about the evaluation results.
- E 8. (ASIIN 4.3) It is recommended to create more flexible opening hours of the laboratories.

#### **For the Bachelor's degree programme Chemistry**

- E 9. (ASIIN 1.3) It is recommended to strengthen contents of homogenous and heterogeneous catalysis in the curriculum.

- E 10. (ASIIN 1.3) It is recommended to reintroduce the following elective modules on organic and inorganic synthesis as mandatory: Practical Applications of Organic Chemistry, Advanced Practical Organic Chemistry as well as Practical Inorganic Chemistry.

## I Fulfilment of Requirements (29.03.2019)

<b>Degree programme</b>	<b>ASIIN-label</b>	<b>Subject-specific label</b>	<b>Accreditation until max.</b>
Ba Chemistry	Requirement 4 not fulfilled.		6 months prolongation
Ba Biochemistry	Requirements 2 and 4 not fulfilled.		6 months prolongation
Ba Botany	Requirement 4 not fulfilled.		6 months prolongation
Ba Microbiology	Requirement 4 not fulfilled.		6 months prolongation

# Appendix: Programme Learning Outcomes and Curricula

According to the self-assessment report the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor degree programme Biochemistry:

## PROGRAM-SPECIFIC LEARNING OUTCOMES

### Knowledge

1. Describe the basics of biochemistry from the perspectives of cellular, enzymatic and nutritional aspects.
2. Explain molecular biology and its implications in cell activity and disease.
3. Summarize the biophysical fundamentals of the biochemical processes.
4. Recognize the principles of biochemistry in clinical applications.

### Cognitive

1. Carry out biochemical experiments and analytical analysis to address scientific problems.
2. Analyze cellular and genetics functions to solve biochemical research problems.
3. Detect chemical and physical principles in biological systems and validate their applications in practical life.
4. Design experimental work in biomedical research laboratories.

### Interpersonal Skills and Responsibility

1. Describe and apply ethical principles involved in conducting research in clinical and basic biochemistry, including issues pertaining to human subjects and animal care and use, and defend the significance and application of these principles to research problems.
2. Plan responsibility for their own learning and continuing personal and professional development,
3. Work effectively in teams and exercise leadership when appropriate.



**Communication, Information Technology and Numerical Skills**

1. Demonstrate the ability to search the internet for literature and information in particular areas of biochemistry.
2. Read and critique scientific articles, demonstrate scientific writing skills, and deliver oral presentations.
3. Evaluate biochemical calculations in experiments and data analysis.

**Psychomotor Skills (if applicable)**

1. Not applicable.

Biochemistry Program Learning Outcomes:

ILO#	Description
ILO-1	Discuss and explain the chemical principles of biological catalysis, thermodynamic, and bioenergetics of biological activity.
ILO-2	Describe the essential features of cell metabolism and its control
ILO-3	Explain the principles that determine the structure of biological macromolecules, and how structure enables function
ILO-4	Acquire a critical understanding of the molecular processes of the cell and relevant experimental methods
ILO-5	Apply and recognize clinical features of biochemistry including the immune system, hormonal regulation, and biomarkers of health and diseases
ILO-6	Use and attain competence in experimental methods of biochemistry and molecular biology
ILO-7	Extract proper and relevant information related to any area of Biochemistry including genomics, proteomics, and bioinformatics.
ILO-8	Prepare process, interpret, and present data, using appropriate qualitative and quantitative techniques.
ILO-9	Analyze and summarize information critically, including published research
ILO-10	Employ critical thinking in the performance, design, interpretation and documentation of laboratory experiments.
ILO-11	Understand theoretical concepts of instruments that are commonly used in biochemistry fields.

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ILO-12	Conduct biochemical research independently and in collaboration with others.
ILO-13	Communicate, deliver oral presentation
ILO-14	Understand professional and scientific ethics

The following **curriculum** is presented:

Compulsory Courses				
Semester (provider)	Course Code	Course Name	Pre-re- quisite	Credit Hours
First (prepara- tory)	MATH140	Introductory Mathematics	None	2
	ENG140	English Language (1)	None	8
	CUR140	Learning, Thinking and Research Skills	None	3
	CHS150	Health and Fitness (2)	None	1
		<b>Total</b>		
Second (prepara- tory)	ENT101	Entrepreneurship	None	1
	CT140	Computer skills	None	3
	MC140	Communication Skills	None	2
	MATH150	Calculus	MATH140	3
	ENG150	English Language (2)	ENG140	8
		<b>Total</b>		
Third (BSc BCH program)	Chem101	General Chemistry (1)	None	4
	Zoo103	Principles of general Zoology	None	3
	Stat106	Biostatistics	None	2
	MIC140	Microbiology	None	3
		<b>Total</b>		
Fourth (BSc BCH program)	Phys102	General Physics (2)	None	4
	Chem108	Introduction in Organic Chemistry	None	4
	BCH201	General Biochemistry (1)	None	3

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	Chem231	Chemical Thermodynamic	None	2
		<b>Total</b>		<b>13</b>
Fifth (BSc BCH program)	Chem251	Analytical Chemistry	None	3
	BCH302	General Biochemistry (2)	BCH201	4
	BCH312	Biochemical Calculations	BCH201	3
	BCH320	Enzymes	BCH201	3
	BCH322	Experiments in Enzymology	BCH201	2
	Chem341	Heterocyclic Organic Chemistry	Chem108	2
		<b>Total</b>		<b>17</b>
Sixth (BSc BCH program)	BCH332	Biophysical Biochemistry	BCH302	3
	BCH333	Experiments in Biophysical Biochemistry	BCH302	2
	BCH340	Metabolism (1)	BCH320	3
	BCH361	Molecular Biology	BCH302	4
	BCH471	Biochemistry of Blood	BCH302	3
		<b>Total</b>		<b>15</b>
Seventh (BSc BCH program)	BCH440	Metabolism (2)	BCH340	3
	BCH447	Practical Metabolism	BCH340	2
	BCH452	Biomembranes and Cell Signaling	BCH302	2
	BCH462	Biotechnology & Genetic engineering	BCH361	4
	BCH485	Training in the Principles and Scientific Research skills	BCH340 BCH361	2
		<b>Total</b>		<b>13</b>
Eighth (BSc BCH program)	BCH445	Nutritional Biochemistry	BCH302	3
	BCH453	Hormones	BCH340	2
	BCH463	Bioinformatics	BCH361	3
	BCH477	Immunology	BCH440	2

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	BCH497	Research and Seminar	BCH333 BCH340 BCH485	3
		<b>Total</b>		<b>13</b>

List of electives:

Group	Course Code	Course Name	Pre-requisite	Credit Hours
<b>GI</b>	SLM100	Studies in Prophet Seerah	None	2
	SLM101	Fundamentals of Islamic Culture	None	2
	SLM102	Family in Islam	None	2
	SLM103	Islamic economy	None	2
	SLM104	Islamic politics	None	2
	SLM105	Human Rights	None	2
	SLM106	Medical Jurisprudence	None	2
	SLM107	Ethics	None	2
	SLM108	Current topics	None	2
	SLM109	Women & her role in Improvement	None	2
<b>GII</b>	ZOO352	Principles of Genetics	ZOO342	2
	MIC450	Medical Virology	MIC250	3
	MIC460	Medical Bacteriology	MIC260	3
<b>GIII</b>	BCH102	Cellular Biochemistry	None	2
	BCH434	Biophysics	BCH340	2
	BCH441	Bioenergetics	BCH320	2
	BCH450	Biochemistry of Specialized Tissues	BCH340	2
	BCH472	Biochemistry of Biological Fluids	BCH320	3
	BCH473	Biomarkers in Health & Diseases	BCH320	3

	BCH436	Nanotechnology	BCH361 BCH440	2
	BCH454	Toxicology & Carcinogens	BCH440 BCH462	2
	BCH464	Gene Expression	BCH361 BCH440	2
	BCH465	Biochemical Genetics	BCH361 BCH440	2
	BCH466	Molecular Biology of Cancer	BCH440 BCH462	2

According to the self-assessment report the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor degree programme Microbiology:

(i) Summary description of the knowledge to be acquired

- Lab skills (Chemical, Clinical and biological Labs)
- Research, Presentation and communication skills
- Principles of Microbiological Sciences (Taxonomy, Physiology, Pathology, Genetics, etc.
- Role of microorganisms in life and their relations with other organisms
- How to detect and treat with diseases caused by Microorganisms
- Role in Microorganisms in Medicine, Economy, Nutrition, Scientific development and different other sides of life
- The basics of biotechnology used for the diagnosis of the molecular and cellular disease
- Principle of the basic science (Mathematics, statistics, organic, inorganic and analytical chemistry, biochemistry and physics
- Some basic of the Islamic studies and foreign languages
- Data statistical analysis and scientific essay writing skills

(i) Cognitive skills to be developed and level of performance expected

- Skills to collect scientific results and data drafting and presentation
- The skills of the data statistical analysis
- Skills of scientific research and writing of report and scientific paper
- Foreign language skills
- Communication skills
- Skills to deal with laboratory samples of the various science and learn how to be analyzed and study
- Skills of fine technology related to the study of plant science and related sciences
- The skill of self-learning

The skill of the lecture preparation and presentation

The following **curriculum** is presented:

1 <sup>st</sup> 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)	
<b>Total of Credit Hours</b>				<b>14</b>	

2 <sup>nd</sup> Semester					
Course Code	Course Title	Pre- Req.	Co- Req.	Credits (Lect.- Exre.- Pract.)	
CT 140	Computer Skills (E)	-	-	3 (0+0+3)	
MC 140	Communication Skills	-	-	2 (2+0+0)	
ENG 150	English Language (2) (E)	ENG 140	-	8 (8+0+0)	
MATH 150	Differential Calculus (E)	140 MATH	-	3 (2+1+0)	
ENT 101	Entrepreneurship	-	-	1 (1+0+0)	
<b>Total of Credit Hours</b>				<b>17</b>	

3 <sup>rd</sup> Semester					
Course Code	Course Title	Pre- Req.	Co- Req.	Credits	
CHEM 101	General Chemistry (1)	-	-	4(3+0+1)	
BCH 101	General Biochemistry	-	-	4 (3+0+1)	
MBIO. 140	General Microbiology	-	-	3 (2+0+1)	
STAT 106	Biostatistics	-	-	2 (1+1+0)	
<b>Elective course from University requirement</b>			-	2 (2+0+0)	
<b>Total of Credit Hours</b>				<b>15</b>	

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4 <sup>th</sup> Semester				
Course Code	Course Title	Pre- Req.	Co- Req.	Credits
MBIO 240	Laboratory Skill	MBIO 140	-	2 (0+0+2)
MBIO 250	General Virology		-	3 (2+0+1)
MBIO 260	General Bacteriology		-	3 (2+0+1)
MBIO 270	General Mycology		-	3 (2+0+1)
Free course			-	2
<b>Elective course from University requirement</b>			-	2 (2+0+0)
<b>Total of Credit Hours</b>				<b>16</b>

5 <sup>th</sup> Semester				
Course Code	Course Title	Pre- Req.	Co- Req.	Credits
MBIO 280	Biology of Microalgae	MBIO140	-	2 (1+0+1)
FSN 321	Food Microbiology	MBIO (260, 270)	-	3 (2+0+1)
MBIO 330	Microbial Physiology	MBIO (240, 250, 260, 270)	-	3 (2+0+1)
MBIO 340	Microbial Ecology & Pollution	MBIO (250, 260,	-	3 (2+0+1)
<b>Elective course from Outside Specialization</b>		Variable	-	3
<b>Elective course from University requirement</b>			-	2 (2+0+0)
<b>Total of Credit Hours</b>				

6 <sup>th</sup> Semester				
Course Code	Course Title	Pre- Req.	Co- Req.	Credits
MBIO 320	Microbial Diagnosis	MBIO (240, 250,	-	2 (1+0+1)
MBIO 334	Biochemical Instrumentation Techniques	MBIO (250, 260,	-	2 (1+0+1)
MBIO 344	Sanitation and Water Microbiology	MBIO 340	-	2 (1+0+1)
MBIO 351	Microbial Genetics	MBIO (250, 260,	-	3 (2+0+1)
MBIO 362	Microbial fine structure	MBIO (250, 260,	-	2 (1+0+1)
MBIO 465	Industrial microbiology	FSN 321,	-	2 (1+0+1)
<b>Elective course from Outside Specialization</b>		Variable	-	2
<b>Elective course from University requirement</b>			-	2 (2+0+0)
<b>Total of Credit Hours</b>				

7 <sup>th</sup> Semester				
Course Code	Course Title	Pre- Req.	Co- Req.	Credits

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<b>MBIO 466</b>	Introduction to Petroleum Microbiology	MBIO (340, 344)	-	2 (1+0+1)
<b>MBIO 451</b>	Immunology	MBIO 351	-	3 (2+0+1)
<b>MBIO 450</b>	Medical Virology	MBIO 250	-	3 (2+0+1)
<b>MBIO 460</b>	Medical Bacteriology	MBIO 260	-	3 (2+0+1)
<b>MBIO 470</b>	Medical Mycology	MBIO 270	-	3 (2+0+1)
<b>MBIO 490</b>	Scientific Communication	After 6 <sup>th</sup> Semester		1 (1+0+0)
<b>MBIO 499</b>	Research Project	MBIO (450, 460,	MBIO 490	3 (0+0+3)
<b>Total of Credit Hours</b>				<b>18</b>

8 <sup>th</sup> Semester				
Course Code	Course Title	Pre- Req.	Co- Req.	Credits
<b>MBIO 493</b>	Training in medical microbiology laboratories	MBIO (450, 470,	None	6 (0+0+6)
Six Elective courses from Specialization		MBIO 140	-	12
<b>Total of Credit Hours</b>				<b>18</b>

According to the website report the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor degree programme Chemistry (Accessed 18 December 2018: <https://sciences.ksu.edu.sa/en/node/829>):

Skills and Capabilities of BSc. in Chemistry graduate:

- Has the knowledge of concepts and basic theories of chemistry.
- Recognize methods of safety in chemicals laboratories and has the ability to assess the hazards of chemicals.
- Has sufficient skill to conduct chemical reactions to prepare and identify chemicals using modern equipment's and study their properties.
- Can interpret results by linking chemical and physical concepts with mathematical expressions using computer software and the internet.
- Can prepare and present practical results of scientific research clearly to the public and answer questions in a scientific manner.
- Apply the necessary skills for continuing learning and professional development taking the advantage of developments in the field of chemistry.
- Have awareness of sustainable development and the role of chemistry in minimizing negative impacts on the environment.
- Practical scientific and creative thinking in the search for solutions to some industrial and environmental problems in society.



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- Has open mind and being objective, respect the others' point of view, and ethics of scientific research.
- Have the initiative and the ability to manage time, effective planning, and take appropriate decisions in the field of work.
- Has the ability to continue his postgraduate studies in the fields of chemistry.

The following **curriculum** is presented:

First Level				Second Level			
Course	Name	Prereq.	Units	Course	Name	Prereq.	Units
ENG 140	English (1)	None	8	TEC 140	Computer skills	None	3
MATH 140	Mathematics (1)	None	2	MATH 150	Mathematics (2)	MATH 140	3
NHG 140	Research, learning skills	None	3	ENG 150	English (2)	ENG 140	8
HEL 150	Health & Fitness	None	1	SCI 150	Communication skills	None	2
				ENT 101	Entrepreneurship	None	1
<b>Total</b>			<b>14</b>	<b>Total</b>			<b>17</b>
Third Level				Fourth Level			
Course	Name	Prereq.	Units	Course	Name	Prereq.	Units
CHEM 101	General Chemistry (1)	None	4 (3+1)	CHEM 222	CHEM. of Main Groups	CHEM 101	3 (3+0)
CHEM 107	General Chemistry (2)	None	3 (3+0)	CHEM 231	Chemical thermodynamics	CHEM 101	2 (2+0)
MATH 111	Integration Calculus	Math 150	4 (3+1)	CHEM 240	Organic Chemistry (1)	CHEM 101	2 (2+0)
PHYS 102	General Physics (2)	None	4 (3+1)	CHEM 247	Iden. of Org. Comp.	CHEM 107	2 (0+2)
	University requirement (Elective course)	None	2 (2+0)	CHEM 250	Vol. and Grav. Ana.	CHEM 107	4 (3+1)
					University requirement (Elective course)	None	2 (2+0)
					Elective Course		3
<b>Total</b>			<b>17</b>	<b>Total</b>			<b>18</b>

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<b>Fifth Level</b>				<b>Sixth Level</b>			
Course	Name	Prereq.	Units	Course	Name	Prereq.	Units
	University re-requirement	None	2 (2+0)		University re-requirement	None	2 (2+0)
CHEM 321	CHEM. of Transition Elements	CHEM 222	2 (2+0)	CHEM 322	Quantum Chemistry (1)	CHEM 107 + Math 111	2 (2+0)
CHEM 331	Phases of Substances and Solutions	CHEM 231	2 (2+0)	CHEM 328	Inorganic Compounds Spectroscopy	CHEM 321	2 (2+0)
CHEM 337	Practical Physical Chemistry (1)	CHEM 231	2 (0+2)	CHEM 332	Chemical Kinetics	CHEM 231	2 (2+0)
CHEM 340	Organic Chemistry (2)	CHEM 240	2 (2+0)	CHEM 341	Heterocyclic Organic Chemistry.	CHEM 340	2 (2+0)
CHEM 351	Spectroscopic Methods	CHEM 250	2 (1+1)	CHEM 342	Polymers and Petrochemicals.	CHEM 340	2 (2+0)
	CHEM. Elective Course		2	CHEM 352	Electo-analytical Methods	CHEM 250	2 (1+1)
	CHEM. Elective Course		2		CHEM. Elective Course		2
	Free Elective Course		2		Free Elective Course		2
<b>Total</b>			<b>18</b>	<b>Total</b>			<b>18</b>
<b>Seventh Level</b>				<b>Eighth Level</b>			
Course	Name	Prereq.	Units	Course	Name	Prereq.	Units
CHEM 422	Chemistry of Solid State	CHEM 321	3 (2+1)	CHEM 424	Organometallic Chemistry	CHEM 321	2 (2+0)
CHEM 435	Chemistry of Interfacial Surfaces	CHEM 231	2 (2+0)	CHEM 451	Chemical Separation and Chromatographic Methods	CHEM 351	2 (1+1)
CHEM 438	Practical Physical Chemistry (2)	CHEM 331	2 (0+2)	CHEM 499	Research Project		3 (0+3)
CHEM 441	Organic Compounds Spectroscopy	CHEM 341	2 (2+0)		CHEM. Elective Course		2
CHEM 497	Training on Chemical Instrument	CHEM 351	2		CHEM. Elective Course		2

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	CHEM. Elective Course		2		CHEM. Elective Course		2
	CHEM. Elective Course		2		Elective Course		3
	Free Elective Course		2		Free Elective Course		1
<b>Total</b>			<b>17</b>	<b>Total</b>			<b>17</b>

According to self-assessment report the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor degree programme Botany:

KPI #	NQF Learning Domains and Learning Outcomes	Method of LOs Assessment	Date of Assessment
1.0	<b>Knowledge</b>		
1.1	Identify the major groups of organisms with an emphasis on plants and be able to classify them within a phylogenetic framework.	Exams discussions Homework's Essays & quizzes	Monthly exams Weekly discussions final exams
1.2	Recognize principles of different Botanical sciences; as Genetics, Physiology, Ecology, Morphology, Taxonomy, .... etc		
1.3	Demonstrated knowledge of form, function, mechanism, organization, scale, hierarchy, diversity and evolution		
1.4	Describe specific examples to explicate how descent with modification has shaped plant morphology, physiology, and life history		
2.0	<b>Cognitive Skills</b>		
2.1	Apply the scientific method to questions in Botany by formulating testable hypotheses, gathering data that address these hypotheses, and analyzing those data to assess the degree to which their scientific work supports their hypotheses.	Reports & Essays Solving problems Group Discussion	Monthly exams Weekly discussions

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2.2	Apply fundamental mathematical tools (statistics, calculus) and physical principles (physics, chemistry) to the analysis of relevant biological situations.	Exams Presentation	final exams
2.3	Design both laboratory and field experiments		
2.4	Appreciation for ethical conduct in science.		
2.5	Discriminate & Discuss how organisms function at the level of the gene, genome, cell, tissue, organ and organ-system.		
2.6	Explicate the ecological interconnectedness of life on earth by tracing energy and nutrient flows through the environment.		
2.7	Relate the physical features of the environment to the structure of populations, communities, and ecosystems.		
3.0	<b>Interpersonal Skills &amp; Responsibility</b>		
3.1	Work in groups	Direct observation Group projects Periodic reports peer assessment	Through practical labs Attendance certificates
3.2	Attend workshops and seminars		
3.3	working as team leader		
3.4	Promote familiarity with a range of techniques relevant to application of the biological sciences		
4.0	<b>Communication, Information Technology, Numerical skills</b>		
4.1	Entry and use of databases	Group projects Reports Homework's	Through practical labs and classes
4.2	Ability to retrieve information from databases		
4.3	present knowledge and concepts both in writing and orally		
5.0	<b>Psychomotor Skills</b>		
5.1	Ability to manipulate laboratory ware and instruments	Observation lab work	During Laboratory
5.2	Ability to prepare reagent for experiments	Field work	

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5.3	Ability to extract, examine and analyze DNA and proteins from plants tissues	lab exam	Final practical exam
5.4	Ability to prepare and examine plant cytological and anatomical preparations		
5.5	Ability to achieve experiments in the field of molecular biology and genetics		

The following **curriculum** is presented: