



ASIIN Seal

Accreditation Report

Bachelor's Degree Programme
Biotechnology and Genetic Engineering

Provided by
Jordan University of Science and Technology

Version: June 28th 2019

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A About the Accreditation Process

Name of the degree programme (in original language)	(Official) English translation of the name	Labels applied for ¹	Previous accredita- tion (issu- ing agency, validity)	Involved Technical Commit- tees (TC) ²
تقانات حيوية وهندسة وراثية	Bachelor of Science in Biotechnology and Genetic Engineering	ASIIN	none	10
<p>Date of the contract: 17.05.2018</p> <p>Submission of the final version of the Self-Assessment Report: 23.07.2018</p> <p>Date of the onsite visit: 16. – 19.10.2018</p> <p>at: Irbid, Jordan</p>				
<p>Peer panel:</p> <p>Prof. Dr. Hans-Joerg Jacobsen, Hannover University</p> <p>Prof. Dr. Markus Schnare, Marburg University</p> <p>Dr. Eckhard Guenther, Aeterna Zentaris GmbH</p> <p>Joud Al-Quqa , German Jordanian University, student</p>				
<p>Representative of the ASIIN headquarter: Rainer Arnold</p>				
<p>Responsible decision-making committee: ASIIN Accreditation Commission for Degree Programmes</p>				
<p>Criteria used:</p> <p>European Standards and Guidelines as of 15.05.2015</p> <p>ASIIN General Criteria as of 28.03.2014</p> <p>Subject-Specific Criteria of Technical Committee 10 – Life Sciences as of 09.12.2011</p>				

¹ ASIIN Seal for degree programmes

² TC 10 – Life Sciences

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

B Characteristics of the Degree Programmes

a) Name	Final degree (original/English translation)	b) Areas of Specialization	c) Corresponding level of the EQF ³	d) Mode of Study	e) Double/Joint Degree	f) Duration	g) Credit points/unit	h) Intake rhythm & First time of offer
Biotechnology and Genetic Engineering	Bachelor of Science		6	Full time	No	4 years	132 Jordan Credit Points,	Fall and Spring Semester/ 2000

For the Bachelor's degree programme Biotechnology and Genetic Engineering the Jordan University of Science and Technology (JUST) has presented the following profile in its Self-Assessment Report:

“The idea of establishing a new Biotechnology and Genetic Engineering Department within the Faculty of Science and Arts at Jordan University of Science and Technology started back in 1998. The new Department was designed not only to keep the University up with the rapid advances in biotechnology and genetic engineering, but also to prepare the students for rewarding careers whether in industry, academia or government. In addition, the new Biotechnology & Genetic Engineering curriculum will equip students with sufficient theoretical knowledge and practical skills in different disciplines of Biotechnology that are required for the world of the 21st century.

The decision to establish a Biotechnology & Genetic Engineering Program is considered as one of the most important steps the University took to meet the demand for trained Biotechnologists. Indeed shifting the classical training to advance science can improve standards of living, bridging the gap between science and marketing and responding to the need of Jordan and the regional countries.

The Biotechnology & Genetic Engineering program brings a unique combination of skills and wide range of scientific disciplines together to maximize the benefit of both teaching and research programs. The research interests of the Department staff spans a broad range including Microbiology, Biochemistry, Genetics, Plant Biology, Molecular Biology, Industrial Microbiology, Immunology and Animal Biotechnology.

³ EQF = The European Qualifications Framework for lifelong learning

Vision

Our vision is to be a Center of Excellence in the field of Biotechnology in Jordan and the region.

Mission

Our mission is to develop a leading biotechnology teaching and research department in order to produce Competent Biotechnologists and Researchers through quality education to provide the needs and challenges of the country and the region.”

C Peer Report for the ASIIN Seal

1. The Degree Programmes: Concept, content & implementation

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

Evidence:

- Self-Assessment Report
- Module descriptions
- Webpage Department of Biotechnology and Genetic Engineering:
<http://www.just.edu.jo/FacultiesandDepartments/FacultyofScienceandArts/Departments/BiotechnologyandGeneticEngineering/Pages/Biotechnology%20and%20Genetic%20Eng.aspx>
- Discussions during the audit

Preliminary assessment and analysis of the peers:

The peers refer to the Subject-Specific Criteria (SSC) of the Technical Committee Life Sciences as a basis for judging whether the intended learning outcomes of the Bachelor's degree programme Biotechnology and Genetic Engineering as defined by the Jordan University of Science and Technology (JUST) correspond with the competences as outlined by the SSC. They come to the following conclusions:

The purpose of the Bachelor's degree programme Biotechnology and Genetic Engineering is to train and educate graduates that leave the program having a fundamental understanding of biotechnology, molecular biology, and genetic engineering and to give them a clear understanding of the underlying scientific principles. They should acquire basic theoretical knowledge and concepts of the natural sciences, mathematics, and computer science in order to be able to understand the importance of microorganisms, cell- and tissue cultures in the development, exploitation and commercialisation of biological processes and to be able to manipulate and engineer genes for the benefit of humans.

In addition, practical skills in the preparation, implementation, and evaluation of biotechnological experiments should be obtained. Moreover, students should learn to familiarize

themselves with new areas of biotechnology, be able to search and understand specialist literature, to write scientific texts, and to present results.

The students should develop technical expertise that allows them directly entering the labour market as laboratory technicians, supporting current research in fundamental biological phenomena as well as applied science fields. The programme also prepares students for graduate work in genetics, molecular biology, biochemistry, and other health-related disciplines.

Typical areas of employment are biomedical and biotechnology companies, chemical, pharmaceutical, and agricultural industry, as well as hospitals. In addition, graduates have job opportunities in research centres, universities, and public administration.

The auditors hold the view that the objectives and intended learning outcomes of the Bachelor's degree programme Biotechnology and Genetic Engineering as mentioned in the Self-Assessment Report are reasonable and the job perspectives are realistic. During the discussion with the auditors, the employers confirm that graduates from JUST have very good theoretical and practical skills and are in general better qualified in comparison to graduates from other similar programmes in Jordan. Although the employers are overall satisfied with the graduates' qualification profile, they stress that the working experience needs to be improved. From their experience, practical skills are needed, especially if the students want to work for a research-oriented company. The peers explicitly support this point of view and recommend increasing the field training (see criterion 2.1).

In addition, the peers point out that the objectives and learning outcomes of the Bachelor's degree programme Biotechnology and Genetic Engineering should be accessible to all stakeholders. For example, this could be achieved by publishing them on the Department's webpage (see criterion 5.3).

Programme outcomes as defined by the SSC have been divided into the categories "Specialist Competences" and "Social Competences". The SSC are the result of an assessment, regularly performed by ASIIN Technical Committees, which summarise what is considered as good practice by a professional community formed equally by academics and professional practitioners in higher education and is required as future-oriented quality of training in the labour market.

Based on the Self-Assessment Report and the discussions during the on-site-visit, the peers see that graduates of the Bachelor's degree programme Biotechnology and Genetic Engineering acquire most of the necessary subject-related competences. They obtain basic theoretical knowledge in the core biomedical subjects and are qualified to carry out practical

work in the field of biotechnology. Furthermore, graduates are able to solve subject-relevant problems and can present the results. During the course of their studies, the students also acquire social competences, such as the ability to work in a team and to communicate with each other.

In summary, the auditors are convinced that the intended qualification profile of the Bachelor's degree programme Biotechnology and Genetic Engineering allows graduates to take up an occupation, which corresponds to their qualification. The peers judge the objectives and learning outcomes to be suitable to reflect the intended level of academic qualification (EQF 6) and mostly correspond with the ASIIN Subject-Specific-Criteria (SSC) of the Technical Committee 10 – Life Sciences.

Criterion 1.2 Name of the degree programme

Evidence:

- Self-Assessment Report

Preliminary assessment and analysis of the peers:

The auditors hold the opinion that the English translation and the original Jordanian name of the Bachelor's degree programme Biotechnology and Genetic Engineering corresponds with the intended aims and learning outcomes as well as the main course language (English).

Criterion 1.3 Curriculum

Evidence:

- Self-Assessment Report
- Study plan
- Module descriptions
- Webpage Department of Biotechnology and Genetic Engineering:
<http://www.just.edu.jo/FacultiesandDepartments/FacultyofScienceandArts/Departments/BiotechnologyandGeneticEngineering/Pages/Biotechnology%20and%20Genetic%20Eng.aspx>
- Discussions during the audit

Preliminary assessment and analysis of the peers:

JUST has developed and included in the Self-Assessment Report a comprehensive matrix that shows, which intended learning outcome should be achieved by which course. This matrix makes apparent that the objectives of the Bachelor's degree programme Biotechnology and Genetic Engineering are substantiated by the courses and it is clear to the peers, which knowledge, skills and competences students will acquire in each course.

In summary, the peers see that the curriculum allows the students to achieve the intended learning outcomes.

Criterion 1.4 Admission requirements

Evidence:

- Self-Assessment Report
- General Regulations for awarding the Bachelor's Degree of the Jordan University of Science and Technology
- Discussions during the audit

Preliminary assessment and analysis of the peers:

Admission to JUST mostly depends on the grades of the high school graduates. They must pass the Jordanian High School Diploma (Tawjihi) with a minimum grade of 65% in the scientific classes. All Jordanian high school graduates that want to study at a university must fill out an application form with 20 options based on their preferences in different subjects and universities. Applicants are ranked based on their high school grades and the best get their first choice.

In addition, some students are accepted based on the profession of their parents. For instance, students whose parents are working at JUST would compete with students from the same group for an assigned number of placements.

Finally, 5% of the available placements are reserved for Jordanian students who obtained their high school diploma abroad.

The auditors learn during the discussion with the programme coordinators that every year around 200 new students are admitted to the Bachelor's degree programme Biotechnology and Genetic Engineering. This number is determined by the Biotechnology and Genetic Engineering Department based on the available resources (number of faculty members and laboratory places). The number of admitted students seems to be adequate; the students confirm this impression.

In summary, the auditors find the terms of admission to be binding and transparent. They confirm that the admission requirements support the students in achieving the intended learning outcomes.

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

The peers see that students are required to spend a minimum of 200 field training hours (8 weeks with an average of 5 hours a day) during the summer semester. For this reason, the field training cannot encompass more than the allocated 8 weeks. Nevertheless, students can increase the scope of the field training by rotating between at least two places so that they will gain more practical experience. The peers also suggest offering optional field training opportunities during the other summer semesters.

The peers consider the criterion to be mostly fulfilled.

2. The Degree Programmes: Structures, methods and implementation

Criterion 2.1 Structure and modules
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Evidence:

- Self-Assessment Report
- Study plan
- Module descriptions
- General Regulations for awarding the Bachelor's Degree of the Jordan University of Science and Technology
- Webpage Department of Biotechnology and Genetic Engineering:
<http://www.just.edu.jo/FacultiesandDepartments/FacultyofScienceandArts/Departments/BiotechnologyandGeneticEngineering/Pages/Biotechnology%20and%20Genetic%20Eng.aspx>
- Discussions during the audit

Preliminary assessment and analysis of the peers:

The Bachelor's degree programme Biotechnology and Genetic Engineering is offered by the Department of Biotechnology and Genetic Engineering, which is part of the Faculty of Science and Arts of JUST.

One Jordanian Credit Point (CP) is awarded for one hour of theoretical lecture or three hours of practical laboratory work. This only includes contact hours, the students' self-study hours are not taken into consideration. Hence, there is no conversion rate between Jordanian CPs and the European Credit Point Transfer System (ECTS). This issue will be discussed in more detail under criterion 2.2.

The curriculum is divided into five sections and consists of 132 CP. The first section are the University Compulsory Requirements where the students have to cover 16 CP: Arabic Language, Social Responsibility, Entrepreneurship and Innovation, General Skills, Military Sciences, and English Language.

The second section are the University Elective Requirements. Students have to take classes worth a total of 9 CP that can be chosen from a long list of courses from all faculties.

The third section are the Faculty (Science and Arts) Compulsory Requirements that encompass 19 CP. These courses are basic introductory courses in the natural sciences, mathematics and informatics. In detail, the following classes have to be taken: Calculus, Mathematical Applications of Biological Sciences, Elements of Statistics, General Physics 1 + 2 + Lab, Programming in C++.

The most important parts of the programme are the Department (Biotechnology and Genetic Engineering) Compulsory Requirements. The students have to cover 75 CP out the following areas: General Biology, General Chemistry, Microbiology, Biochemistry, Organic Chemistry, Analytical Chemistry, Cell Biology, Bioinformatics, Immunology, Molecular Biology, Genetics, and Biotechnology. Since the start of the academic year 2018/19, the research project is now also a compulsory course, before it was an elective.

Finally, there are the Department Elective Requirements. They encompass 13 CP and offer the students the opportunity to specialise in different areas of Life Sciences e.g. Bacteriology, Virology, Protein Biotechnology, Pharmaceutical Biotechnology or Environmental Biotechnology.

The peers discuss with the programme coordinators in detail about the current curriculum and possible changes. The peers see that there are some redundancies in the courses and they learn that programme coordinators try to avoid content overlaps by reviewing the syllabus and talking to the teachers. In addition, focus groups of teachers have been re-

cently initiated in order to coordinate the course content and adjust it if unnecessary overlaps are found. The peers appreciate this effort and point out that course contents should be described in more detail in the syllabus to make transparent that similar topics are discussed from a different perspective.

The peers learn that “Scientific Writing and Presentation” is an elective. Since all students starting the degree programme from the academic year 2018/19 will have to conduct a research project, the auditors strongly recommend making “Scientific Writing and Presentation” a compulsory course and offering it in the second or third year of studies. This will help to better prepare the students for writing laboratory reports and conducting the research project. Moreover, the students point out that the course should focus more on scientific writing and not only on writing in English. The auditors also suggest introducing the students to good laboratory practise and scientific conduct (e.g. citation rules, plagiarism).

The auditors discuss with the employers if they offer internships and how students gain practical experience. There is a 3 CP hours training course (field training) in the curriculum, students can do it as an internship in a hospital lab or in a company. The employers stress that it would be useful for the students to get more practical experience in order to be able to get acquainted with different areas, which will improve their job perspectives. The students support this point of view. For this reason, the auditors suggest increasing the scope of the field training.

During the discussion with the auditors, the students criticize that the biochemistry course is not well adapted to the needs of a Biotechnology programme. Currently, the course is taught for several different departments and, therefore, has a very general content. The auditors understand the students’ concerns and recommend critically reviewing the content of the biochemistry course and better adapting it to Biotechnology students’ needs. In addition, it would be best taught by a member of the Biotechnology Department who knows the requirements of students in this programme.

Furthermore, the students point out that the course “Elements of Statistics” is not very suitable for Biotechnology students, because it is a very general course and is not designed for degree programmes in the area of life sciences. The auditors support this point of view and suggest offering a course in biostatistics rather than a general course in statistics. With respect to the courses in physics, the students are convinced that two classes (General Physics 1 and General Physics 2) is a lot of physics and it could be reduced to one combined course. The programme coordinators explain that the two classes in physics are faculty requirements, therefore, the number of credit hours cannot be changed, but the content can be adjusted to the needs of the Biotechnology students. This has already been done and

the focus is now more on biophysics. The auditors accept this explanation and see no need to issue a recommendation with respect to the scope and content of the physics courses.

In general, the auditors stress that Biotechnology and Genetic Engineering are rapidly changing and developing areas where frequently new discoveries are made. Consequently, the programme coordinators should make sure that the content of the courses is updated regularly and that the study plan keeps up with current developments in the area of Biotechnology and Genetic Engineering and the new field of Genome Editing. One possible means to alleviate this problem is the seminar that is offered to the students as an extra-curricular activity. Experts from companies or other universities give lectures about current topics. The auditors appreciate this opportunity but point out that it is voluntary for the students to attend and that no credits are awarded. Therefore, they suggest making this course at least an elective.

International Mobility

The peers discuss with the programme coordinators whether there are windows of mobility for the students and point out that the international visibility and reputation of an university is increased by its research activities and the academic mobility of staff members and students. The academic mobility of the faculty members is already quite high and almost all teachers have international experience and contacts. Only a few Bachelor's students spend some time abroad, usually in form of an ERASMUS+ programme. For example, last year one Biotechnology student studied for one semester in Portugal. By contrast, there are 20 to 25 % international students at JUST and all courses are taught in English. The International Office supports and helps the international students.

Since the auditors learn from students that some of them plan to apply for international Master's programmes and want to spend some time abroad during the Bachelor's programme, the Department of Biotechnology and Genetic Engineering should initiate exchange programmes with international universities and actively support the students in gaining international experience. This would ensure that the Biotechnology students do not have to compete with students from other departments for the few ERASMUS+ places that JUST offers. A good starting point to initiate international cooperations are the manifold personal international contacts of the faculty members.

The auditors emphasize that it is very useful for students to spend some time abroad already during their Bachelor's studies to improve their English proficiency and to enhance their opportunities for being accepted in an international Master's programme.

With respect to the recognition of credits gained at other institutions, the peers learn that the current regulations comply with the Lisbon Convention, which states that achievement

and competences acquired at another higher education institution must be recognised unless the institution that is charged with recognition, in this case by JUST, can prove substantial differences. By signing a learning agreement before staying abroad, it is guaranteed that the credits acquired at a foreign university are accepted at JUST.

Criterion 2.2 Work load and credits

Evidence:

- Self-Assessment Report
- Study plan
- Module descriptions
- Discussions during the audit

Preliminary assessment and analysis of the peers:

The auditors perceive that the underlying credit hour system used for assigning credit points primarily reflects attendance times of students, without including working hours required for self-studies. Workload indicates the time students typically need to complete all learning activities (such as lectures, seminars, projects, practical work, self-study and examinations). The number of credits ascribed to each component should be based on its weight in terms of the workload students need in order to achieve the learning outcomes.

The estimation of workload must not be based on contact hours only (i.e. hours spent by students on activities guided by teaching staff). It embraces all the learning activities, including the time spent on independent work, compulsory work placements, preparation for assessment and the time necessary for the assessment. In other words, a seminar and a lecture may require the same number of contact hours, but one may require significantly greater workload than the other because of differing amounts of independent preparation by students.

Using this approach, all the teaching staff are involved in the process of credit allocation. They can put forward their proposals in terms of learning outcomes, and estimate the workload necessary to achieve them.

Typically, the estimated workload will result from the sum of:

- the contact hours for the educational component (number of contact hours per week x number of weeks)
- the time spent in individual or group work required to complete the educational component successfully (i.e. preparation beforehand and finalising of notes after attendance)

at a lecture, seminar or laboratory work; collection and selection of relevant material; required revision, study of that material; writing of papers/projects/dissertation; practical work, e.g. in a laboratory)

- the time required to prepare for and undergo the assessment procedure (e.g. exams)

Since workload is an estimation of the average time spent by students to achieve the expected learning outcomes, the actual time spent by an individual student may differ from this estimate. Individual students differ: some progress more quickly, while others progress more slowly. Therefore, the workload estimation should be based on the time an “average students” spends on self-studies and preparation for classes and exams. The initial estimation of workload should be regularly refined through monitoring and student feedback.

Within the ECTS, one credit corresponds to 25 to 30 hours of students’ work. JUST should follow this framework and make transparent exactly how many hours of workload are needed for one credit point. By considering students’ workload in curriculum design and delivery, JUST would facilitate mobility from institution to institution, from country to country, and between different educational sectors and contexts of learning.

The peers discuss with the programme coordinators about the current dropout rates and the average length of studies. They learn that the numbers included in the Self-Assessment Report are not correct. Students enrol for the degree programme but at the same time, they retake classes at high school in order to improve their GPA with the goal to change to another major (e.g. medicine). Other students change their major because they find out that Biotechnology and Genetic Engineering does not match their interests and abilities or they switch because they expect better job opportunities in other areas.

As the students confirm during the audit, the actual dropout rate is between 10 and 20 % and it is no problem to finish the degree programme within the expected 4 years. Actually, it is possible to finish the degree programme in 3.5 years if students take classes in the summer semester.

In summary, the auditors conclude that there is no general structural pressure on the quality of teaching and the level of education due to the workload. The total workload appears to be adequate and the students are able to complete the degree programme without exceeding the regular period.

Criterion 2.3 Teaching methodology

Evidence:

- Self-Assessment Report

- Study plan
- Module descriptions
- Discussions during the audit

Preliminary assessment and analysis of the peers:

In the Bachelor's degree programme Biotechnology and Genetic Engineering, several different educational methods such as lecture, seminar, practical laboratory work, field training, and research project are applied.

The overall learning model at JUST is aimed at improving the students' competences through discussions, practical work, and lectures. Practical work is designed to impart good laboratory skills and is usually done as a group activity. The peers positively acknowledge that assignments and laboratory work are essential parts of many courses.

Students are regularly provided with assignments and homework that require answering, calculating, performing investigations, conducting comparative studies, analysing, exploring and coming up with conclusions. They are also given tasks such as writing projects and independent work that requires problem solving and higher order thinking. The field training can be performed in companies, at research institutes and laboratories or at JUST.

To help the students to achieve the intended learning outcome and to facilitate adequate learning and teaching methods JUST provides a digital learning platform. Teachers and students use it for presenting course material like papers and assignments and for communicating with each other.

In summary, the peer group judges the teaching methods and instruments to be suitable to support the students in achieving the intended learning outcomes.

Criterion 2.4 Support and assistance

Evidence:

- Self-Assessment Report
- Study plan
- Module descriptions
- Discussions during the audit

Preliminary assessment and analysis of the peers:

JUST provides a support system for all students on different levels. It includes consultations with an advisor for academic affairs about graduation requirements and general study regulations. On a more personal level, teachers are available for advice on each course. In addition, students have the opportunity to participate in student clubs and social activities.

The system of support and assistance, which results in a trustful atmosphere between students and teaching staff, is one of the strengths of JUST. The peers see that the teachers are accessible and there are enough resources available to provide individual assistance, advice and support for all students. The support system helps the students to achieve the intended learning outcomes and to complete their studies successfully and without delay. The students are well informed about the services available to them. The only critical point the auditors find is that the students are apparently not familiar with the mathematics help laboratory. This useful institution is run by advanced students and should be made better known to the Biotechnology students.

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

The peers appreciate that JUST will introduce students to scientific writing and presentations, as well as good laboratory practice, as part of the research project course. In addition, in the next plan modification (2020) the scientific writing course will be moved to the obligatory courses and given a weight of 2 CP. The peers support this plan.

The peers thank JUST for clarifying that there is already a seminar course, which is obligatory for fourth year students. Normally students are required to give their seminar on new topics such as Genome Editing, microbiome, Real time PCR, etc.

JUST agrees with the peers about the importance of increasing the students' academic mobility. The peers do not expect that all students will be able to spend some time abroad during their undergraduate studies and that there are certain constraints (economic, personal, cultural etc.) that hinder students from studying in another country. However, they still think that academic mobility should be increased (e.g. by providing up-to-date information related to scholarships and exchange programmes, and by establishing collaborations between the Department of Biotechnology and Genetic Engineering and international universities).

The peers consider the criterion to be mostly fulfilled.

3. Exams: System, concept and organisation

Criterion 3 Exams: System, concept and organisation
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Evidence:

- Self-Assessment Report
- Study plan
- Module descriptions
- General Regulations for awarding the Bachelor's Degree of the Jordan University of Science and Technology
- Discussions during the audit

Preliminary assessment and analysis of the peers:

According to the Self-Assessment Report, a variety of examination forms is used for assessing the intended learning outcomes. In the course of the degree programme, the students' achievements are assessed by different methods such as midterm exams, assignments and homework, laboratory reports, presentations, and the final exams. There is also an ongoing monitoring of the students' progress in their studies; it is evaluated by the teaching staff based on participation and preparation for the classes.

The form and contribution of each exam to the final grade is mentioned in the module descriptions that are available to the students via the JUST e-learning platform. The academic performance for each module is graded on a scale from 0 to 100. 40 points are allocated for the final examination, while 60 points are allocated for semester assignments consisting of written examinations and other type of assessment methods.

The final exam in each module is a written examination, which typically includes multiple-choice questions, essays, problem-solving or case-based questions and calculation problems. Most final examinations are paper-based, computer-based examinations are only held for classes with more than 100 students.

At the end of each semester, students must attain a minimum of 50 points to pass the class. If a student fails a class, he can retake it as many times as he wants. It is also possible to repeat a class in order to improve the final grade. For repeating failed examinations, students can retake the course during the summer semester or within the regular course of the next academic term. The summer semester is an optional third term designed for students who have credit deficits or want to earn extra credits in order to be able to earlier

complete the programme. The further details are determined in JUST's General Regulations. The students confirm during the audit, that there is a general exam schedule, overlaps are avoided and they are informed in time about the exam date.

The peers notice that the majority of assignments, especially all final exams, are written exams. Other assessment methods are underrepresented such as oral exams and presentations. However, such assessment methods are important to better prepare the students for an academic career (e.g. joining a Master's programme) and enhancing their job opportunities. As stated in PEO.2, the programme aims "to equip our graduates with good communication skills in order to be able to fit in the job market and develop their computer skills." This point is underlined by PLO4, because graduates should be able to "demonstrate effective reading, critical thinking, and problem solving skills as well as exhibiting effective oral and written communication skills." In order to achieve these intended learning outcomes it would be necessary to increase the number of oral exams and presentations. This point of view is supported by the students who complain in the discussion with the auditors that most exams are written exams and that oral exams and presentations are only conducted in very few classes.

As stated in the Self-Assessment Report, with the start of the academic year 2018/2019 the research project is now a compulsory course for all Biotechnology and Genetic Engineering students starting the degree programme. Before, the research projects was only an elective. According to the programme coordinators, the course is designed to provide students with research experience including aspects of literature search, planning and designing experiments, data collection, analysis, and interpretation. Students should also gain experience in scientific communication by submitting a written final report and defending the results of their research in front of a faculty committee. JUST has provided a very detailed module description and expects all faculty members to provide possible topics for the research project so that all students will be able to take part at a project. Since the research project will be conducted of a group of three to four students the auditors point out that it is important that the individual contribution of each student becomes apparent and that there will be individual grades. The programme coordinators ensured that this will be done; also, the oral presentation of the results will be split between all students taking part at the project.

During the audit, the peers inspect sample examination papers and research projects and are overall satisfied with the general quality of the samples.

The peers confirm that there is a form of assessment for each course and that all students are well informed about the form of assessment and the details of what is required to pass the course. The organization of the exams guarantees that delays in the study progress are

avoided. The relevant rules for examination and evaluation criteria are put into a legal framework, as both students and lecturers confirm during the audit. The date and time of the exams and how the exams are taken is announced to the students in due time at the beginning of each semester.

The peers come to the conclusion that the examinations are suitable to verify whether the intended learning outcomes are achieved or not.

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

The peers acknowledge offering more oral exams and presentations is only suitable for courses with a small number of students. Courses such as special topics, ethics of biotechnology, embryology, laboratory management and similar courses are good candidates for this purpose and JUST will start this practice as soon as the end of the semester. However, JUST points out that as part of the research project students can be examined orally during their project presentations. One other form of oral exams that is in practice now is asking the students to prepare scientific posters about a particular subject as a part of a course and to answer questions from the reviewers and fellow students.

The peers consider the criterion to be mostly fulfilled.

4. Resources

Criterion 4.1 Staff

Evidence:

- Self-Assessment Report
- Staff handbook
- Study plan
- Module descriptions
- Discussions during the audit

Preliminary assessment and analysis of the peers:

The auditors confirm that JUST has a sufficient academic staff and is well equipped for teaching. According to the Self-Assessment Report, there are currently 23 active faculty members in the Department of Biotechnology and Genetic Engineering (8 professors, 6 associate professors, 4 assistant professors, and 5 lecturers). The academic staff members

are supported by a number of part-time teaching assistants for laboratories (Master's students). In addition, the department has 3 full-time laboratory supervisors, a number of part-time supervisors (10-15) mainly comprised of Master's students, and a full time secretary.

Almost all of the staff members at the Department of Biotechnology and Genetic Engineering have done their PhD abroad and have spent some time at an international university. The peers explicitly laude the international experience of the teachers and are convinced this will help to further promoting the internationalisation of the Department and the academic mobility of the students.

During the discussion with the faculty members, the auditors learn that there are enough resources for conducting research activities and that the teaching load is adequate. The academic staff also teaches in the Master's programme Applied Biology and gives classes for other majors (e.g. medicine).

In summary, the peers confirm that the composition, scientific orientation and qualification of the teaching staff is suitable for successfully implementing and sustaining the Bachelor's degree programme Biotechnology and Genetic Engineering. There are enough resources available for administrative tasks, and supervision and guidance of students.

The open-minded atmosphere among the staff members and their dedication to further developing the programme impress the auditors.

Criterion 4.2 Staff development

Evidence:

- Self-Assessment Report
- Staff handbook
- Discussions during the audit

Preliminary assessment and analysis of the peers:

At JUST, there are sufficient offers and support mechanisms available for teachers who wish to further develop their professional and teaching skills. For example, there is a Faculty Development Center at JUST that offers workshops for faculty members to improve their teaching skills and to get acquainted with new didactical methods. All faculty members have to take part at a minimum of two workshops in order to get promoted. In addition, enough funds are available for spending time abroad e.g. for attending seminars, conferences or workshops or for taking part at research projects.

During the discussion with the peers, the teachers express their satisfaction with the support by the university and the opportunities for further didactic and scientific development.

A paid leave of absence for participating in international research projects is possible either during the summer time or for a whole semester (sabbatical) and several staff members graduated or received their Ph.D. from international universities and have personal contacts with international universities. A sabbatical can be taken once every six years. The auditors are particularly impressed by the regulation that double salary is paid by JUST during the sabbatical or the summer leave. In addition, JUST covers the cost for participating at international conferences. The international orientation of the staff members is one of the strong points of the Biotechnology and Genetic Engineering programme.

Criterion 4.3 Funds and equipment

Evidence:

- Self-Assessment Report.
- On-site-visit of the laboratories, classrooms, and the library
- Discussions during the audit

Preliminary assessment and analysis of the peers:

During the audit, the peer group also visits some laboratories, classrooms and the nearby JUST library in order to assess the quality of infrastructure and technical equipment. They notice that there are no bottlenecks due to missing equipment or a lacking infrastructure.

With respect to the teaching laboratories, the peers notice that there is no air-conditioning installed. Since the laboratories are used by groups of 15 to 20 students, it will get very warm, especially during summer time. The peers hold the view that it is necessary to ensure a moderate temperature in the teaching laboratories by installing air-conditioning. The programme coordinators point out during the discussion with the auditors that

In general, research experiments need to be performed under controlled conditions for reproduction purposes and transferability including the temperature. Furthermore, incubation temperatures of for example 37°C during the experiments cannot be ensured if the environmental temperature is above 37°C.

JUST has concrete plans to build a solar energy facility that would generate enough energy for running air-conditioning in all laboratories and classrooms. This plan should be realised within the next two years. The auditors support this plan and recommend putting it into action as soon as possible.

The peers are impressed by the well-equipped research laboratories in the Princess Haya Biotechnology Centre that is situated in the central hospital. The laboratories are fully equipped with some advanced instruments (e.g. real time PCRs, DNA sequencer, 2 D gel electrophoresis, DNA synthesizer, HPLC, metabolomics analyzer) and can be used by the Bachelor's students for doing their research project.

The JUST library offers access to electronic scientific and educational resources and to the electronic library system, including current publications that are needed for study and research. Moreover, access to international scientific databases like SpringerLink and Scifinder is possible. Overall, the students are very satisfied with the available literature and services provided by the library. They also express their general satisfaction with the available resources and conditions of studying, thereby confirming the positive impression of the peer group.

The auditors conclude that there are sufficient funds and equipment and that the infrastructure (laboratories, library, seminar rooms etc.) in general complies with the requirements for sustaining the degree programme.

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

The peers explicitly support the plan to have most of the university's electricity harvested from solar energy and to use this energy for air conditioning of the laboratories and classrooms. This plan should be put into practise as soon as possible.

The peers consider the criterion to be mostly fulfilled.

5. Transparency and documentation

Criterion 5.1 Module descriptions
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Evidence:

- Self-Assessment Report
- Study plan
- Module descriptions
- General Regulations for awarding the Bachelor's Degree of the Jordan University of Science and Technology

- Webpage Department of Biotechnology and Genetic Engineering:
<http://www.just.edu.jo/FacultiesandDepartments/FacultyofScienceandArts/Departments/BiotechnologyandGeneticEngineering/Pages/Biotechnology%20and%20Genetic%20Eng.aspx>
- Discussions during the audit

Preliminary assessment and analysis of the peers:

The auditors confirm that the module descriptions (syllabus) are accessible to all students and teachers via the university`s homepage and the e-learning platform.

The module descriptions available to the auditors revealed some shortcomings: not all descriptions include information on the composition of the final grade, the exam methods and the intended learning outcomes (e.g. syllabus for Basic Biotechnology). In general, the module descriptions should be aligned with international standards and mention the responsible teacher, all teaching and exam methods, the composition of the final grade, the work load and the awarded credits, the intended learning outcomes and the content, and recommended literature. In addition, the auditors did not receive the module descriptions for the classes offered by other departments (e.g. chemistry and physics). For this reason, the auditors firstly expect JUST to update the module description in order to include all necessary information and secondly to submit the module descriptions off all compulsory classes.

Criterion 5.2 Diploma and Diploma Supplement

Evidence:

- Self-Assessment Report
- Sample Diploma Certificate
- Sample Transcript of Records

Preliminary assessment and analysis of the peers:

The auditors acknowledge that the Biotechnology and Genetic Engineering students are awarded a Diploma Certificate and a Transcript of Records after graduation.

On the other hand, the auditors notice that no Diploma Supplement exists at JUST. They point out that each student should receive a Diploma Supplement shortly after graduation. The Diploma Supplement was introduced to inform about the structure and content of the respective degree programme. It must include a description of the academic career, the competences acquired during the studies, explain the qualification gained including the

achieved learning outcomes and the context, level, content and status of the studies that were pursued and successfully completed.

In order to rate the level of academic education and qualification from a study programme, as common practice in countries JUST wishes to compete with, the auditors expect that all graduates are provided with a standardised Diploma Supplement that complies with the internationally accepted standards for a Diploma Supplement. They stress that a Diploma Supplement should be automatically issued together with JUST's diploma after graduation. The graduates benefit from this standardised document because this way their academic qualification is more easily recognised abroad, the description of their academic career and the competences acquired during their studies are included, and it offers them easier access to opportunities for work or further studies abroad. Graduation represents the culmination of the students' period of study. Students need to receive documentation explaining the qualification gained, including achieved learning outcomes and the context, level, content and status of the studies that were pursued and successfully completed.

Criterion 5.3 Relevant rules

Evidence:

- Self-Assessment Report
- Webpage Department of Biotechnology and Genetic Engineering:
<http://www.just.edu.jo/FacultiesandDepartments/FacultyofScienceandArts/Departments/BiotechnologyandGeneticEngineering/Pages/Biotechnology%20and%20Genetic%20Eng.aspx>
- Discussions during the audit

Preliminary assessment and analysis of the peers:

The auditors confirm that the rights and duties of both JUST and the students are clearly defined and binding. All rules and regulations are available to the students via the e-learning platform. However, the auditors notice that not all relevant information about the degree programme (study plan, complete syllabus, learning outcomes, job perspectives) is published on the department's website and hence available to all relevant stakeholders.

The auditors, therefore, expect that all relevant course-related information is made accessible for all stakeholders, e.g. by publishing it on the department's webpage.

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

The peers expect the Department of Biotechnology and Genetic Engineering to issue a Diploma Supplement to every graduate. A sample diploma supplement should be submitted to ASIIN in order to fulfill this requirement.

The peers consider the criterion to be mostly fulfilled.

6. Quality management: Quality assessment and development

Criterion 6 Quality management: quality assessment and development

Evidence:

- Self-Assessment Report
- Discussions during the audit
- General Regulations for awarding the Bachelor's Degree of the Jordan University of Science and Technology

Preliminary assessment and analysis of the peers:

The auditors discuss the quality management system at JUST with the programme coordinators. They learn that there is a continuous process in order to improve the quality of the degree programme and it is carried out through internal and external evaluation.

Internal evaluation of the quality of the Bachelor's degree programme Biotechnology and Genetic Engineering is provided through course exit surveys, a graduate exit survey and an alumni survey.

First, there is a course exit survey that is conducted in all undergraduate and postgraduate degree programmes of JUST. It is organised centrally by the Academic Development Centre (ADC) with the purpose of evaluating the performance of the teachers. This evaluation is conducted in every course at the end of each semester just before the final exams take place. It includes the same questions for all programmes and is done online. All students have to participate; otherwise, they are not allowed to take part at the final exam. The results are collected and analysed by the ADC. Each teacher receives his course evaluation results, which should serve as a guide for any improvement in the teaching process.

As the peers find out during the discussions with the teaching staff and the students, the results of the course exit surveys are usually not discussed with the students. The programme coordinators confirm that there is no feedback to the students about the course evaluations. If there is negative feedback, the Dean of the College of Science and Arts talks to the respective teacher, analyses the problems, and offers guidance.

The auditors gain the impression that the survey is mainly used for evaluating the teachers' performance and comparing them with each other in order to assist career development decisions and not for further developing the degree programme. The faculty members confirm that the survey results are taken into account if they want to be promoted (e.g. from associate professor to full professor).

Some teachers also discuss with their students directly how to improve the course but that practise is not common usage. The auditors point out that the students' feedback has to be taken seriously by the teaching staff and changes should be made if there is critique. For this reason, they expect that the students are informed about the result of the course surveys and that all teachers discuss with them how to improve the course. The Biotechnology Department should also get the information about the evaluation outcomes from classes taught by other departments (e.g. chemistry, physics, and mathematics) in order to have arguments for improving the course programme. The peers also learn that there is a complaint box for the students that can be used for suggestions or criticism. The peers support this possibility but point out that this cannot substitute the feedback on the course evaluation results.

Secondly, JUST also conducts a graduate exit survey by asking graduating students to evaluate the importance of each course that they have taken during the course of their studies and to determine the students' level of satisfaction with the respective degree programme.

Finally, JUST conducts an alumni survey. It is designed to provide feedback on the job perspectives and fields of employment of the graduates.

External quality assessment of the degree programme is carried out by the national Jordanian Accreditation and Quality Assurance Commission for Higher Education Institutions.

Students of each department are represented by a member in JUST's student union. The student union itself is represented by its chair in the university council where he can convey student concerns or requests to the university administration.

The peers learn from JUST's partners from public institutions and private companies that they meet with faculty members and discuss the needs and requirements of the job market and possible changes to the degree programme. In addition, there is an Alumni Office at

JUST that tries to keep in contact with the graduates and that regularly organises a student fair with possible employers. As the peers consider the input of the employers to be very important, they appreciate their involvement.

In summary, the peer group confirms that the quality management system is suitable to identify weaknesses and to improve the degree programmes. The students are somewhat involved in the process but not all feedback loops are closed. The peers stress that it is necessary to develop a culture of quality assurance with the involvement of all stakeholders in the process.

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

The peers understand that course evaluations are conducted at the end of the semester. One possibility is to give a feedback on the results to the students via email. In any case, it is important to enhance the involvement of the students in the quality assurance of the degree programme.

The peers consider the criterion to be mostly 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:

- module descriptions (syllabus) for all compulsory classes

E Comment of the Higher Education Institution (16.11.2018)

The institution provided a detailed statement as well as the following additional documents:

- module descriptions (syllabus) for the compulsory classes taught by other departments

F Summary: Peer recommendations (21.11.2018)

Taking into account the additional information and the comments given by JUST, the peers summarise 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 Biotechnology and Genetic Engineering	With requirements for one year	-	30.09.2024

Requirements

- A 1. (ASIIN 2.2) Ensure that the awarded credits correspond with the actual workload of the students.
- A 2. (ASIIN 5.1) Rewrite the module descriptions to include information about the content, qualification objectives, exam methods, the actual workload and awarded credits.
- A 3. (ASIIN 5.2) Issue a Diploma Supplement that contains detailed information about the educational objectives, intended learning outcomes, the structure and the academic level of the degree programme as well as about the individual performance of the student.
- A 4. (ASIIN 5.3) Ensure that all relevant course-related information is accessible for all stakeholders.
- A 5. (ASIIN 6) Make sure that the students are involved in improving and further developing the degree programme.

Recommendations

- E 1. (ASIIN 2.1) It is recommended to offer a course in biostatistics and not in general statistics.
- E 2. (ASIIN 2.1) It is recommended to better adapt the biochemistry course to the needs of the Biotechnology and Genetic Engineering students.
- E 3. (ASIIN 2.1) It is recommended to regularly update the course content in order to keep up with current developments in the area of Biotechnology and Genetic Engineering.
- E 4. (ASIIN 2.1) It is recommended to send more Jordanian students abroad and to establish cooperations with international universities on a departmental level.
- E 5. (ASIIN 4.1) It is recommended to install air-conditioning in the teaching laboratories.

G Comment of the Technical Committee 10 – Life Sciences (23.11.2018)

Assessment and analysis for the award of the ASIIN seal:

The Technical Committee follows the proposed requirements and recommendations.

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

Degree Programme	ASIIN-seal	Subject-specific label	Maximum duration of accreditation
Ba Biotechnology and Genetic Engineering	With requirements for one year	-	30.09.2024

H Decision of the Accreditation Commission (07.12.2018)

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

The Accreditation Commission discusses the procedure and decides to include additional recommendations with respect to extending the field training, introducing a class in scientific writing and conducting more oral exams. The Accreditation Commission also acknowledges that JUST has signalled that they will follow these suggestions. Otherwise, the Accreditation Commission follows the suggestions of the peers.

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

Degree Programme	ASIIN-seal	Subject-specific label	Maximum duration of accreditation
Ba Biotechnology and Genetic Engineering	With requirements for one year	-	30.09.2024

Requirements

- A 1. (ASIIN 2.2) Ensure that the awarded credits correspond with the actual workload of the students.
- A 2. (ASIIN 5.1) Rewrite the module descriptions to include information about the content, qualification objectives, exam methods, the actual workload and awarded credits.
- A 3. (ASIIN 5.2) Issue a Diploma Supplement that contains detailed information about the educational objectives, intended learning outcomes, the structure and the academic level of the degree programme as well as about the individual performance of the student.
- A 4. (ASIIN 5.3) Ensure that all relevant course-related information is accessible for all stakeholders.
- A 5. (ASIIN 6) Make sure that the students are involved in improving and further developing the degree programme.

Recommendations

- E 1. (ASIIN 1.3) It is recommended to increase the scope of the field training.

- E 2. (ASIIN 1.3) It is recommended to make the course “Scientific Writing and Presentation” a mandatory part of the curriculum.
- E 3. (ASIIN 1.3) It is recommended to offer a course in biostatistics and not in general statistics.
- E 4. (ASIIN 1.3) It is recommended to better adapt the biochemistry course to the needs of the Biotechnology and Genetic Engineering students.
- E 5. (ASIIN 1.3) It is recommended to regularly update the course content in order to keep up with current developments in the area of Biotechnology and Genetic Engineering.
- E 6. (ASIIN 2.1) It is recommended to send more Jordanian students abroad and to establish cooperations with international universities on a departmental level.
- E 7. (ASIIN 3) It is recommended to conduct more presentations and oral exams.
- E 8. (ASIIN 4.3) It is recommended to install air-conditioning in the teaching laboratories.

I Fulfilment of Requirements (28.06.2019)

Comments of the peers and the Technical Committee (13.06.2019)

Requirements

- A 1. (ASIIN 2.2) Ensure that the awarded credits correspond with the actual workload of the student.

Initial Treatment	
Peers	fulfilled Vote: unanimous Justification: JUST has converted the credits for all the courses to ECTS based on surveying the students in each course for the actual time they spend outside the lecture time.
TC 10	fulfilled Vote: unanimous Justification: The Technical Committee follows the auditors' assessment.

- A 2. (ASIIN 5.1) Rewrite the module descriptions to include information about the content, qualification objectives, exam methods, the actual workload and awarded credits.

Initial Treatment	
Peers	fulfilled Vote: unanimous Justification: All the module descriptions were re-written and now include all necessary information. In addition, all descriptions were collected in one document and posted on the department's webpage.
TC 10	fulfilled Vote: unanimous Justification: The Technical Committee follows the auditors' assessment.

- A 3. (ASIIN 5.2) Issue a Diploma Supplement that contains detailed information about the educational objectives, intended learning outcomes, the structure and the academic level of the degree programme as well as about the individual performance of the student.

Initial Treatment	
Peers	fulfilled Vote: unanimous Justification: JUST has designed a Diploma Supplement and will issue it to all students along with the official documents students receive upon graduation.
TC 10	fulfilled Vote: unanimous Justification: The Technical Committee follows the auditors' assessment.

- A 4. (ASIIN 5.3) Ensure that all relevant course-related information is accessible for all stakeholders.

Initial Treatment	
Peers	fulfilled Vote: unanimous Justification: All module descriptions were collected in one document and posted on the department's webpage.
TC 10	fulfilled Vote: unanimous Justification: The Technical Committee follows the auditors' assessment.

- A 5. (ASIIN 6) Make sure that the students are involved in improving and further developing the degree programme.

Initial Treatment	
Peers	fulfilled Vote: unanimous Justification: JUST has developed an action plan to get the students more involved in improving the programme; the plan includes the following measures: a. One student; the department student representative in the student union was added to the Department Curriculum Committee. b. Two former students (Alumni) were added to the Department Advisory Board. c. A Student Academic Committee was formed consisting of five members.
TC 10	fulfilled Vote: unanimous Justification: The Technical Committee follows the auditors' assessment.

Decision of the Accreditation Committee (28.06.2019)

Degree programme	ASIIN-label	Subject-specific label	Accreditation until max.
Ba Biotechnology and Genetic Engineering	All requirements fulfilled	-	30.09.2024

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's degree programme Biotechnology and Genetic Engineering:

Program Educational Objectives (PEOs)

PEO.1. To equip graduates with thorough knowledge and skills in biotechnological concepts that serves the local and global market.

PEO.2. To equip our graduates with good communication skills in order to be able to fit in the job market and develop their computer skills.

PEO.3. To prepare our students for critical thinking and reasoning, skeptical inquiry and scientific approach to solve problems.

PEO.4. To prepare students that understands and applies basic research methods, including experimental design, data analysis and interpretation.

PEO.5. To prepare our graduates for a wide variety of post-baccalaureate paths, including graduate school, professional training programs, or entry level jobs in any area of biotechnology.

Program Learning Outcomes (PLOs)

Upon completion of the BSc. in Biotechnology and Genetic Engineering degree students will be able to:

PLO1 (A). Demonstrate knowledge and comprehension of core concepts, which includes but is not limited to knowledge of cell biology, biochemistry, genetics, molecular biology, microbiology and immunology.

PLO2 (B). Exhibit basic laboratory skills necessary for the field of biotechnology and genetic engineering.

PLO3 (C). Utilize and apply knowledge of biotechnology in various applications like industry, medicine, agriculture and other related fields.

PLO4 (D). Demonstrate effective reading, critical thinking, and problem solving skills as well as exhibiting effective oral and written communication skills

PLO5 (E). Recognize and understand ethical and social implications of the use of biotechnology and genetic engineering.

PLO6 (F). Demonstrate knowledge of contemporary issues in biotechnology and genetic engineering.

The following **curriculum** is presented:

First Year / First Semester			
Course No.	Course Title	Credit Hours	Prerequisite
BIO 101*	General Biology 1	3	-
ENG 112	Communication skills 2	3	Passing ENG099 or passing the English Exam with a grade of 50% & above
MATH 101	Calculus	3	-
CHEM 101*	General Chemistry 1	3	-
MS 100	Military Science	3	
HSS129	Entrepreneurship and Innovation	2	-
	Total	17	
First Year / Second Semester			
Course No.	Course Title	Credit Hours	Prerequisite
ARB 101	Arabic Language	3	-
HSS110	Social Responsibility	3	-
CHEM. 107	General Chemistry Lab	1	CHEM 102 or Cor
MATH 102A	Calculus	3	MATH 101
BIO 102	General Biology 2	3	BIO 101 Pass
CHEM 102	General Chemistry 2	3	CHEM 101
BIO 107	General Biology Lab	1	BIO 102 or Cor
	Total	17	

Second Year / First Semester			
Course No.	Course Title	Credit Hours	Prerequisite
BIO 251	Cell Biology	3	BIO 102 Pass + BIO 107 Study
BT 232	Basic Biotechnology	2	BIO 102 Pass
PHY 101* A	General Physics 1	3	-
HSS119	Entrepreneurship and innovation	2	-
CHEM 217	Organic Chemistry	3	CHEM 102 Pass
LM251	Basics in Hematology	3	BIO 102 +BIO 107
	Total	17	
Second Year / Second Semester			
Course No.	Course Title	Credit Hours	Prerequisite
PHY 102A	General Physics 2(for Biological Sciences)	3	PHY 101* A
PHY 107	General Physics Lab	1	PHY 102 or Cor
MATH 131	Elements of Statistics	3	-
CHEM 233	Analytical Chemistry	3	CHEM 102 Pass + CHEM 107 Study
CHEM 234	Analytical Chemistry Lab.	1	CHEM 233 or Cor
CS 115	C++ Programming language	3	
	University Elective 1	3	
	Total	17	

Third Year / First Semester			
Course No.	Course Title	Credit Hours	Prerequisite
BIO 231	General Microbiology	3	BIO 102 Pass
BIO 232	General Microbiology Lab	1	BIO 231 or Cor
CHEM 262	Biochemistry	3	CHEM 217
CHEM 266	Biochemistry Lab	1	CHEM 262 or Cor
BT 363	Tissue culture and Hybridoma Technology	2	BIO 333 and BIO 231
	Department elective 1	2	-
BIO 341	Molecular Genetics	3	BIO 102 Pass
BIO 344	Molecular Genetics Lab	1	BIO 341 or Cor
	Total	16	
Third Year / Second Semester			
Course No.	Course Title	Credit Hours	Prerequisite
BT 301	Bioinformatics	1	BIO 341
BIO 333	Immunology & Serology	3	BIO 331 Study
CHEM 262	General Chemistry Lab	1	CHEM 102 or Cor
BIO 336	Immunology & Serology Lab.	1	BIO 333 or Cor
HSS129	General skills	2	
	Dept. Elective 2	3	
	Dept. Elective 3	3	
	Total	16	-

Fourth Year / First Semester			
Course No.	Course Title	Credit Hours	Prerequisite
BT 431	Microbial Biotechnology	3	BIO 231
	University Elective 3	3	
BT 451	Molecular Biology 1	3	BIO 341 Pass
BT 453	Molecular Biology laboratory	1	BT 451 or Cor
BT 411	Animal Biotechnology	2	BT 232 Pass
BT 441	Human Genetics	3	BIO 341 Pass
	Dept. Elective 4	2	
	Total	14	
Fourth Year / Second Semester			
Course No.	Course Title	Credit Hours	Prerequisite
BT 454	Molecular Biology 2	2	BT 451 + BT 453
BT 421	Plant Biotechnology	3	BT 232 Pass
BT 456	Cytogenetics	3	BT441 Study
	Dept. Elective 5	3	-
BT 491	Seminar	1	Pass 90 C.H
BT 493	Research Project	3	Pass 90 C.H
	University Elective 1	3	
	Total	15	