ASIIN Seal

Accreditation Report

Bachelor's Degree Programme
Chemistry

Provided by
University of Petra, Amman

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 accreditation (issuing agency, validity)	Involved Technical Committees (TC)[2]
عايميك	Bachelor of Chemistry	ASIIN	none	09
Date of the contract: 13.09.2018 **Submission of the final version of the Self-Assessment Report:** 06.01.2019 **Date of the onsite visit:** 19. – 21.03.2019 **at: Amman, Jordan**				
Peer panel: Prof. Dr. Klaus-Uwe Koch, University of Applied Science Recklinghausen Prof. Dr. Heinrich Lang, Technical University Chemnitz Dr. Dietrich Scherzer, BASF SE Tala C. Tadros, University of Jordan, student				
Representative of the ASIIN headquarter: Rainer Arnold				
Responsible decision-making committee: ASIIN Accreditation Commission for Degree Programmes				
Criteria used: European Standards and Guidelines as of 15.05.2015 ASIIN General Criteria as of 28.03.2014 Subject-Specific Criteria of Technical Committee 09 – Chemistry as of 09.12.2011				

[1] ASIIN Seal for degree programmes
[2] TC 09 – Chemistry

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
Chemistry	Bachelor of Science		6	Full time	No	4 years	132 Jordan Credit Points,	Fall and Spring Semester/ 1991

For the Bachelor's degree programme, Chemistry the University of Petra (UOP) has presented the following profile in its Self-Assessment Report:

"The Chemistry program was one of the first programs at the University to be established and licensed for operation (1991) under the umbrella of the Faculty of Sciences. It was recognized and nationally accredited by the Jordanian Higher Education Commission in 1995.The Department of Chemistry is located in the building of Information Technology Faculty (Building No.7).

The undergraduate curriculum includes each of four major chemistry sub- disciplines: analytical, inorganic, organic, and physical chemistry, leading to a B.Sc. Degree in Chemistry. The Department of Chemistry also offers general courses to serve University students and specialized courses to serve students of other departments. Many modern research instruments and equipment furnish the Department of Chemistry. The department is highly equipped with all sorts of chemicals and books.

Vision: The Chemistry Department at the University of Petra is an incubator of excellence, in Jordan and the region for students and scholars.

Mission: The Chemistry Department at the University of Petra prepares knowledgeable and competent chemists and other chemistry related professionals who are committed to excellence in their professional pursuits, with a sound background in both experimental and theoretical aspects of chemistry."

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

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
- Learning objectives of each degree programme according to the SAR (Self-Assessment Report) and the objective-module matrices
- Webpage Department of Chemistry: https://www.uop.edu.jo/En/Academics/FacultyofArtsandSciences/DepartmentofChemistry/Pages/default.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 Chemistry as a basis for judging whether the intended learning outcomes of the Bachelor's degree programme Chemistry as defined by the University of Petra (UOP) correspond with the competences as outlined by the SSC. They come to the following conclusions:

The purpose of the Bachelor's degree programme Chemistry is to train and educate graduates that are knowledgeable and competent chemists. They should be committed to excellence in their professional pursuits, with a sound background in both experimental and theoretical aspects of chemistry.

Graduates should have a fundamental understanding of the core chemical areas (organic, inorganic, analytical, and physical chemistry) as well as a basic understanding of natural sciences and mathematics. In addition, they should be familiar with the underlying scientific methods and principles. Moreover, graduates should understand major chemical concepts and be able to use laboratory techniques. They should also be trained in experimental methods in chemistry, be aware of chemical hazards and how to prevent risks by applying appropriate safety tools, and have a sound knowledge of safety standards for preventing

environmental problems. Moreover, graduates should be capable of using scientific literature and conducting scientific work.

Besides these subject-related competences, graduates should also acquire oral and written communication skills, be able to work in groups, to draft reports, to give presentations, and to be prepared to enter professional life.

Graduates of the Bachelor's degree programme Chemistry have several job opportunities; they can work in the chemical, pharmaceutical, mining or petrochemical industry, at universities as well as in research institutes or in the public administration and schools. All male graduates find adequate jobs in the industry, or continue with a Master's programme. It is different for female students, several become high school teachers. As the employers confirm, there is a large demand for chemistry graduates from pharmaceutical companies and the job perspectives of the graduates from UOP are very good. The Department of Chemistry also announces job vacancies on its facebook page.

The information provided in the Self-Assessment Report and the supplementary information received from the programme coordinators, clearly shows that discipline-related skills are accurately outlined and competences are defined for the Bachelor's level agreeing with the respective Subject-Specific Criteria (SSC) of the ASIIN Technical Committee. The auditors are convinced that the intended qualification profiles of the degree programme under review allows students to find positions reflecting their qualification. The degree programme is designed to meet the particular needs of the local and the national labour market. The auditors consider objectives and learning outcomes of the degree programme appropriate for attaining the intended level of academic qualification.

The auditors hold the view that the objectives and intended learning outcomes of the Bachelor's degree programme Chemistry 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 UOP have very good theoretical and practical skills and are in general better qualified in comparison to graduates from other similar programmes in Jordan.

In summary, the auditors are convinced that the intended qualification profile of the Bachelor's degree programme Chemistry 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 to correspond with the ASIIN Subject-Specific-Criteria (SSC) of the Technical Committee 09 – Chemistry.

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 Chemistry 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 Chemistry: https://www.uop.edu.jo/En/Academics/FacultyofArtsandSciences/DepartmentofChemistry/Pages/default.aspx
- Discussions during the audit

Preliminary assessment and analysis of the peers:

UOP 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 Chemistry are substantiated by the courses and it is clear to the peers, which knowledge, skills and competences students will acquire in each course.

Only English textbooks are used and all exams (written or oral) are conducted in English. Sometimes, lectures are partly held in Arabic e.g. for explaining difficult problems or for making an important issue clear.

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

- Academic Regulations of the University of Petra
- Discussions during the audit

Preliminary assessment and analysis of the peers:

Admission to UOP mostly depends on the grades of the high school graduates. They must pass the Jordanian High School Diploma (Tawjihi) with a minimum grade of 60 % 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.

The auditors notice that the number of newly admitted students has been growing constantly during the last years. In 2011/2012, only 33 new students joined the chemistry programme whereas in 2017/18 there were 162 new students.

Subsequently, the auditors discuss with the programme coordinators about this rapid increase. They want to know what the limit for new students currently is, and how this number is determined.

They learn that around 150 new students can be admitted to the Bachelor's degree programme Chemistry every year. This number is determined by the Department of Chemistry 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:

UOP does not comment on this criterion in its statement.

The peers consider criterion 1 to be fulfilled.

2. The Degree Programmes: Structures, methods and implementation

Criterion 2.1 Structure and modules

Evidence:

- Self-Assessment Report
- Study plan
- Module descriptions
- Academic Regulations of the University of Petra
- Webpage Department of Chemistry: https://www.uop.edu.jo/En/Academics/FacultyofArtsandSciences/DepartmentofChemistry/Pages/default.aspx
- Discussions during the audit

Preliminary assessment and analysis of the peers:
The Bachelor's degree programme Chemistry is offered by the Department of Chemistry, which is part of the Faculty of Arts and Sciences of UOP.

One Jordanian Credit Point (CP) is awarded for one hour of theoretical lecture or two to 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 Bachelor's degree programme Chemistry introduces students to the core subjects of chemistry including inorganic, physical and organic chemistry, and biochemistry as well as analytical chemistry. The programme also conveys fundamentals in the natural sciences and information technology, particularly in physics, mathematics and biology.

The curriculum consists of nine different areas and covers a total of 132 CP. The first area are the University Compulsory Requirements, where students have attend the following four courses (12 CP): *National Education*, *Military Sciences*, *Arabic Language (1)*, and *English Language (1)*. The second, third and fourth areas are the University Elective Requirements where students can chose four electives (12 CP) out of the areas humanities (3 CP), social sciences (3 CP), and science and technology (6 CP). Not all these classes are subject-specific and every student at UOP has to cover these areas, independent of their major. The fifth part of the curriculum are the Faculty Compulsory Requirements (21 CP), these

are introductory courses in the natural sciences such as: *General Chemistry (1 + 2)*, *General Chemistry Lab (1 + 2)*, *Calculus (1 +2)*, and *General Physics (1 + 2 + 3)*. Students should take these classes in the first two semesters.

The most important part of the curriculum are the Department Compulsory Requirements (57 CP). All chemistry students must attend these courses in their second to fourth year of studies. They cover the main areas of chemistry like biochemistry, organic, inorganic, analytical, and physical chemistry. Moreover, the seminar and the research project are also Department Compulsory Requirements. In the seminar students learn about scientific writing and do a presentation on a selected chemical topic. The core chemical classes are supplemented by the Department Elective Requirements. In this area students should attend five courses (15 CP). These courses offer students the opportunity of specialising in certain chemical areas such as *Surface Chemistry & Colloids*, *Computer Applications in Chemistry*, *Nuclear Chemistry*, *Petroleum Chemistry*, or *Environmental Chemistry*. The seventh part of the curriculum are the Department Supportive Compulsory Requirements (9 CP) with classes in *Differential Equations*, *Principles of Statistics*, and *Biology*. Finally, there are the Free Requirements (6 CP) where students can chose any two courses from any major at UOP.

The peers notice that the curriculum does not include a compulsory course on toxicology, ethics in science, health aspects, and safety regulations. The programme coordinators admit, that there is no separate course covering these topics, only some aspects are discussed in the elective course *Environmental Chemistry*. Safety regulations are treated in every laboratory course. However, the peers are convinced that it is also necessary to offer a class about these topics, because they are essential for a comprehensive education in the area of chemistry. The students support this point of view; they think that a mandatory class covering all these topics would be very helpful. In addition, according to the SSC, students need to acquire „knowledge about safety and environmental aspects and the underlying legal regulations“. For this reason, the peers expect UOP to introduce a mandatory class into the curriculum that covers these topics.

The auditors discuss with the employers if the graduates have enough practical experience. The employers stress that it would be useful for the students to get more practical experience in the industry in order to be able to be acquainted with different areas, which will improve their job perspectives. The students support this point of view and stress that they lack hands on experience with the industry. Visiting factories is important too, but the students think that this is not enough. It would be necessary to bridge this gap and get students better acquainted with chemical and pharmaceutical plants. Offering the internship as an alternative to the research project is one step in this direction. It would also be possible to conduct the research project outside UOP in a private company or research institution; this would further promote the contacts between UOP and the industry.

The peers learn that UOP is thinking about offering a Master's degree programme in chemistry. The peers support this plan, because the job opportunities for Master's graduates are even better than for Bachelor's and it would help UOP to increase its research activities. In addition, several students have affirmed their intention to continue their academic education with a Master's degree and would like to do so at UOP.

During the audit, the peers learn that there was a Faculty of Science with Departments in Mathematics, Biology, Physics and Chemistry. Some of the programmes were not successful and thus stopped. The remaining programmes in Mathematics and Chemistry were joined with the Faculty of Arts. However, UOP has concrete plans to re-establish the Faculty of Science with the former four Departments. The peers support these plans, because it is important for a comprehensive academic education in natural sciences to have departments in all relevant areas.

International Mobility

As described in the Self-Assessment Report, UOP has a number of agreements with international universities. One of the main goals of these agreements is to establish, develop, and maintain international relations in the area of exchanging students and staff. UOP students are able to receive a mobility grant for studying abroad. The recognition of credits gained at an international university is based on a learning agreement between the student, UOP, and the hosting university. However, until now no students from the Department of Chemistry have taken part in any international exchange programmes. In addition, the number of international students in the chemistry programme is rather low. Of the 242 chemistry students (in 2018/19), 23 are non-Jordanian but come from neighbouring countries such as Palestine, Syria, Iraq, and Egypt. The programme coordinators explain that the Chemistry students do not go abroad because of the language barrier, financial reasons and because there are sometimes problems to get a visa in time.

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 a 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 several teachers have international experience and contacts.

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 Chemistry should initiate exchange programmes with international universities, invite international guest lecturers, and actively support the students in gaining international experience. A good starting point to initiate international cooperations are the personal international contacts of the faculty members.

As UOP has stated in its goals: “To avail funds and resources, bridge with the outside world and encourage innovation and novelty so as to create opportunities for scientific research, novel discoveries, technology transfer and active participation in conferences and conventions.” it would be necessary to increase internationalisation and to better support and encourage students to spend time abroad.

The peers are surprised to learn the there is only a Department of International Student Affairs that takes care of international students and teachers that want to join UOP, but there is no International Office that supports and advises students from UOP how to organise and finance a stay abroad. Especially financial and visa issue could be handled by such an office and this would definitely help in UOP’s process of internationalisation. Information and documents about ERASMUS+ programme is available on UOP’s homepage but students should get actively encouraged to go abroad and a coordinator from the Department of Chemistry could be nominated who is the first port of call for students and who can coordinate the efforts to inform and help students in organising international stays,

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.

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. UOP 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, UOP would facilitate mobility from institution to institution, from country to country, and between different educational sectors and contexts of learning.

Especially with respect to the research project or the alternative internship, it is necessary to determine the students' total workload. According to the programme coordinators, students should spent 150 hours on the project, but they are only awarded 2 CP. In the ECTS framework, 150 hours would correspond with at least 5 ECTS credit points.

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 revealing the true picture. Students enrol for the chemistry programme but after one or two semesters, they transfer to other programmes at UOP e.g. to Pharmacy. The students are statistically recorded as drop out, but in reality the just change their major. As the students confirm during the audit, the actual dropout rate is rather low (around 10 %) and it is no problem to finish the degree programme within the expected 4 years.

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 Chemistry, several different educational methods such as lecture, seminar, practical laboratory work, and research project are applied.

The overall learning model at UOP 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.

To help the students to achieve the intended learning outcome and to facilitate adequate learning and teaching methods UOP 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:
UOP 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 UOP. 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 weak point the auditors identify is the absence of an International Office for supporting and advising students that what to spent some time at an international university outside Jordan.

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

The peers appreciate that UOP will, in addition to Jordanian credit points, adopt the ECTS and has verified the students' total workload. The submitted table of ECTS credit point for each course seems to be adequate. For this reason, the peers abstain from issuing a requirement to this respect.

UOP points out it its comment that three different elective courses include topics related to chemical hazards, appropriate safety tools, and safety standards for preventing environmental problems. These courses are "Environmental Chemistry", "Environmental Pollution" and "Special Topic in Chemistry". In addition, UOP will include a compulsory course

in “Chemical Toxicology”, beside an elective course in “Public Health and Laboratory Safety”. Moreover, UOP has upgraded the safety rules in the laboratories and has put up additional warning signs for hazardous chemicals. The peers acknowledge these measures but stress that a course on safety, ethics and environmental aspects should be compulsory for all students or at least these topics should be discussed in some compulsory course.

The peers acknowledge that UOP will heed their recommendation to better promote academic mobility of students and faculty members and will try to establish student exchange programmes for Chemistry students.

The peers consider criterion 2 to be mostly fulfilled.

3. Exams: System, concept and organisation

Criterion 3 Exams: System, concept and organisation

Evidence:

- Self-Assessment Report
- Study plan
- Module descriptions
- Regulation for awarding the Bachelor’s degree at the University of Petra
- 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, quizzes 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 main objective of the assessment process is measuring students’ achievements against the intended learning outcomes. Exams may be written or online. Online exams mostly including multiple-choice tests and computational problems, while written exams typically include short questions, essays, and solving problems.

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 Petra University Electronic Learning

System (PUELC). 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 types of assessment methods.

The semester's works for theoretical courses consist of at least two tests (written or online), and one test for practical courses; the exact dates are specified in the syllabus. The period for conducting the first test is the fifth and sixth week of the regular semester; the second test takes place is the eleventh and twelfth week.

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.

A student needs to repeat the compulsory course he has failed. As for an elective course, a student can either repeat it or take another elective course according to what is offered in the study plan. When repeating a course, the higher grade is calculated. All acquired grades are recorded in the student's transcript; however, in the case of repeating a course, the credit hours are only calculated once.

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 UOP's Regulation for awarding the Bachelor's degree. 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.

All chemistry students have to complete a graduation project; it is an individual or a small group (2-3 students) project. There are two possible paths for the graduation project. The first one is a research project with a topic from one of the main fields of chemistry (organic, inorganic, physical or analytical). Students should collect all relevant information and papers and then conduct the necessary experiments. After finishing the experimental part, students should write a short report (20-30 pages) that comprises an introduction, the results, a discussion and a conclusion in addition to references. The second possible path is a training project (industrial training) in which students shall work for a couple of weeks in a chemical company. The second path is important, because it creates a linkage between the Department of Chemistry and the industry. During the last years, the Chemistry Department has increased its efforts to strengthen the relationship with the chemical industry, in

order to expose students to the working work and to provide better job opportunities. The academic advisor helps students to find a suitable topic and explains what teacher offers what projects. At the end of the project, students must submit a report. All students have to conduct an oral presentation of their graduation project. In case of a group project, every student has to submit an individual thesis and has to do a presentation.

According to the programme coordinators, the degree programme aims at preparing students equally well for further academic education and for work in industry. This requires gaining competencies in carrying out independent academic work, demonstrated, for instance, via a research project. However, not all research projects perused during the visit do reflect an adequate scientific level. The auditors underline that all students must learn about scientific working standards, citation rules, and good scientific practice. The mandatory seminar could serve this purpose. In this course, students should learn how to apply tools and concepts of conducting research activities and writing scientific publications.

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.

At the end of their studies, students have to take part at the National Competency Exam, it is a nationwide subject-specific test designed to verify the competencies gained by the students during their course of studies. In comparison with graduates from other Jordanian universities, students from the chemistry programme of UOP are doing very well in the National Competency Exam.

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 thank UOP for submitting the revised course descriptions for the Seminar and the Research Project. However, the peers need to verify, if the adopted changes in the course content lead to better knowledge about good scientific practise, citation rules and writing scientific papers. For this reason, they retain the respective requirement and expect UOP to submit current samples of research projects in the further course of the accreditation procedure.

The peers consider criterion 3 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 UOP has a sufficient academic staff and is well equipped for teaching. According to the Self-Assessment Report, there are currently 10 active faculty members in the Department of Chemistry (1 professor, 6 assistant professors, and 3 lecturers). A number of technicians and lab supervisors supports the academic staff members.

At UOP, the staff members have different academic positions. There are full professors, associate professors, assistant professors and lecturers. The academic position of each staff member is based on research activities, publications, academic education, supervision of students, and other supporting activities. In addition, the responsibilities and tasks of a staff member with respect to teaching load, research, and supervision depend on the academic position.

The peers discuss with the teachers and the programme coordinators about the criteria for reaching the next academic level. They learn that there is a credit point system for teachers that includes research activities, teaching, and supporting activities. The teachers receive credit points for each relevant activity and must achieve a minimum in each area and a certain number in total to be able to be promoted. The staff members consider this process to fair and transparent and utter no complaints.

The auditors discuss with UOP's management about the University's policies with respect to hiring new staff members. They learn that the Department of Chemistry is asked to submit an annual plan that describes what staff vacancies there are and what specific needs the Department has. Vacancies and job specifications are announced on UOP's webpage;

candidates are invited to hold a presentation. So far, this presentation is held in front of the faculty members; no students are included. The auditors hold the opinion that it is important to get feedback from students on the performance of the candidates. For this reason, they recommend including students in the appointment committee and invite them to listen to the presentation and ask them for their opinion.

Several of the staff members at the Department of Chemistry, especially the professors, have done their PhD abroad and have spent some time at an international university. The peers laude the international experience of the teachers and are convinced this would help to further promoting the internationalisation of the Department and the academic mobility of the students.

The peers laude the good teacher-student ratio. Since there are currently 242 chemistry students at UOP and 10 faculty members, the student- teacher ratio is 1:25.

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 gives classes for other Faculties (e.g. in the Faculty of Pharmacy and Medical Sciences).

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 Chemistry. There are enough resources available for administrative tasks, and supervision and guidance of students.

Criterion 4.2 Staff development

Evidence:

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

Preliminary assessment and analysis of the peers:
At UOP, there are sufficient offers and support mechanisms available for teachers who wish to further develop their professional and teaching skills. For example, there is an Academic Development Center at UOP that offers workshops for faculty members to improve their teaching skills and to be acquainted with new didactical methods. All faculty members have to take part at these workshops in order to be 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.

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 the teaching and research facilities 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 each teaching laboratory is equipped with just one fume hood. Since groups of 10 to 16 students use the laboratories, they have to queue for using the hood and conducting their experiments there. The peers hold the view that this is barely sufficient and that it is necessary to install at least a second fume hood in the teaching laboratories to ensure that all experiments can be conducted adequately.

In the general, the teaching laboratories are equipped with the necessary basic instruments. However, there is only one research laboratory; is it used by staff members for their own research activities and by students for conducting the research project. As a result, advanced instruments are missing. The teachers also cooperate with other universities in Jordan and use their research facilities and technical equipment for combined research projects. The auditors support these collaboration but are convinced that UOP should increase the research activities and provide the necessary facilities and equipment on campus in order to fulfil its own mission: “To work towards creating an academic, cultural and social environment that develop quality learning, creativity, innovation and research opportunities and which build up the competencies of UOP members, provide active community service and prepare its students to be capable of creative and critical thinking as well as lifelong learning to actively compete in the marketplace and workforces.” Moreover, the Department of Chemistry should define its focus research areas and plan accordingly; this

includes hiring the "right" staff members, purchasing the needed equipment, and establishing cooperations with universities or private companies that do research in the same areas.

The UOP 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. 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.

On UOP's homepage, pictures are published where students work in a laboratory and handle chemicals without wearing goggles, so the peers gain the impression that the safety regulations are not always followed as strictly as necessary. Therefore, the peers stress how important it is to strictly follow all safety regulations in the laboratories and that UOP should increase its efforts to put all regulations into effect.

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 support purchasing more fume hoods for the laboratories and stress that they should be installed in time and the safety regulations in laboratories need to be followed more strictly.

The peers appreciate that the Department of Chemistry has begun on designing a strategic plan to determine the Department's research profile in order to focus its research activities.

The peers consider criterion 4 to be mostly fulfilled.

5. Transparency and documentation

Criterion 5.1 Module descriptions

Evidence:

- Self-Assessment Report
- Module descriptions

- Webpage Department of Chemistry: https://www.uop.edu.jo/En/Academics/FacultyofArtsandSciences/DepartmentofChemistry/Pages/default.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 Petra University Electronic Learning System (PUELC).

During the audit, the programme coordinators provide the previously missing module descriptions (course syllabus). The auditors notice that some of them reveal shortcomings because information is missing (e.g. form and length of exam, name of course coordinator) this is for example the case in the courses “Inorganic Chemistry 101231”, and “Physical Chemistry Lab (1) 101323”. In general, the descriptions should follow a single template and should be aligned with international standards. All syllabus should include information about the responsible course coordinator, all teaching methods, form and length of exams, the students’ total work load and the awarded credits (Jordanian and ECTS), the intended learning outcomes and the content, and recommended literature.

For this reason, the auditors expect UOP to update the module descriptions in order to include all necessary information.

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 chemistry 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 UOP. 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 UOP 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 UOP'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 Chemistry: https://www.uop.edu.jo/En/Academics/FacultyofArtsandSciences/DepartmentofChemistry/Pages/default.aspx
- Legislation Guide
- Academic Rules
- Regulation for awarding the Bachelor's degree at the University of Petra
- Discussions during the audit

Preliminary assessment and analysis of the peers:
The auditors confirm that the rights and duties of both UOP and the students are clearly defined and binding. All rules and regulations are available to the students via the Petra University Electronic Learning System (PUELC). 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.

While analysing UOP's official regulations the peers could not find any regulations on disability compensation for students. For example, if students are offered alternative assess-

ment forms if it is not possible to conduct the exam in the scheduled form due to the disability. For this reason, the peers ask UOP to submit additional information on how students' disabilities are handled and if regulations on disability compensation exist.

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

The peers thank UOP for submitting additional information with respect to disability compensation at UOP. There is no written regulation; however, UOP abides by a "Disability Strategy" which compromises of various procedures such as providing technical facilities (elevators, disability-friendly toilets, and disability-friendly paths), using the Braille system for blind students, and allowing for alternative learning methods depending on the special needs of the handicapped students. The peers approve these measures and recommend issuing and publishing a corresponding regulation so that students can refer to it.

The peers acknowledge that UOP will issue a Diploma Supplement to its graduates and has submitted a draft. The peers expect UOP to provide the final version in the further course of the accreditation procedure.

The peers confirm that UOP has updated its homepage; however, some information is still missing. For example, the complete course descriptions should be available, the study plan is only in Arabic and the job perspectives are not mentioned. For this reason, the peers expect UOP to provide this additional information on its homepage.

The peers consider criterion 5 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
- Academic Rules

Preliminary assessment and analysis of the peers:
The auditors discuss the quality management system at JUOP 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 Chemistry is provided through course evaluations, a graduate exit survey and an alumni survey.

First, there are the course evaluations that are carried out in all undergraduate and postgraduate degree programmes of UOP. It is organised centrally by the Quality Assurance Department with the purpose of evaluating the performance of the teachers.

These evaluations are administered electronically, and the students' results displayed immediately. This method ensures transparency and objectivity of students' achievement. In addition, each semester senior students are asked to evaluate their achievement of the program student outcomes / competencies through the graduating seniors' survey.

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 Quality Assurance Department. 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 Arts and Sciences 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).

The auditors point out that the students' feedback has to be taken seriously by the teaching staff and changes should 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. Students of each Department are represented by a member in UOP's student council. The student council itself is represented by its chair in the University Council where he can convey student concerns or requests to the University

administration. The primary role of the student council is activating scientific activities among students and supporting students' hobbies and extracurricular activities. However, the auditors learn that there are no student representatives on the Curriculum Committee and thus students are not directly involved in the decision-making processes. Consequently, the auditors suggest incorporating students in the decision-making processes and involving them directly in further improving the degree programme, e.g. by including a student representative in the Curriculum Committee.

Secondly, UOP 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, UOP 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.

The peers learn from UOP'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 UOP that tries to keep in contact with the graduates and that regularly organises a student fair with possible employers. In addition, the Department of Chemistry organised a science day with stakeholders and talked with them about their needs and possible changes to the curriculum. As the peers consider the input of the employers to be very important, they appreciate their involvement. Nevertheless, the auditors are convinced that the communication and ties with alumni and business partners can be improved by establishing an advisory board.

In summary, the peer group confirms that the quality management system is suitable to identify weaknesses and to improve the degree programme. 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 appreciate that UOP will increase the cooperation with the chemical industry and has already established an advisory board with partners from the industry. In addition,

the peers welcome that the Department of Chemistry has re-formed its committees, which now have student members.

The peers also support measures to better involving students in the decision-making processes and to invite students to the course-evaluation workshops. However, the peers point out, that the feedback loops need to be closed and the results of the course evaluations need to be discussed with the students.

The peers consider criterion 6 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:

- Information about the regulation on disability compensation for students at UOP

E Comment of the Higher Education Institution (15.05.2019)

UOP provides a detailed statement as well as the following additional documents:

- Disability Strategy

F Summary: Peer recommendations (27.05.2019)

Taking into account the additional information and the comments given by UOP, 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 Chemistry	With requirements for one year	-	30.09.2024

Requirements

A 1. (ASIIN 2.1) Offer a compulsory course on safety, ethics and environmental aspects.

A 2. (ASIIN 3) Make sure that all students know about writing scientific papers, citation rules, and good scientific practise.

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 5.2) Rewrite the module descriptions to include information about the responsible course coordinator, all teaching methods, form and length of exams, the students' total workload and the awarded ECTS credits.

A 5. (ASIIN 5.3) Ensure that all relevant course-related information is accessible for all stakeholders.

A 6. (ASIIN 6) Close the feedback loops and discuss with the students about the course evaluation results.

Recommendations

E 1. (ASIIN 2.1) It is recommended to offer a Master's programme in chemistry.

E 2. (ASIIN 2.1) It is recommended to send students abroad, to establish cooperations with international universities on a departmental level, to invite international guest lecturers, and to establish an international office for promoting students' exchange.

E 3. (ASIIN 2.1) It is recommended to re-establish Departments of Biology and Physics.

E 4. (ASIIN 4.3) It is recommended to increase the scope of research activities and to provide the required facilities

E 5. (ASIIN 4.3) It is recommended to increase the number of fume hoods in the labs and follow the safety regulations more strictly.

E 6. (ASIIN 5.3) It is recommended to issue and publishing a regulation on disability compensation.

G Comment of the Technical Committee 09 – Chemistry (12.06.2019)

Assessment and analysis for the award of the ASIIN seal:

The Technical Committee notes that the requirements are typical shortcomings in foreign procedures (ECTS points, Diploma Supplement, theses, teaching evaluations, module descriptions). It is positively noted that the university has signalled a great willingness to cooperate and has already begun to implement the requirements and recommendations. In recommendation E 1, the word "offer" should be replaced by "develop", and two editorial changes are made in A 2 ("practice" instead of "practise") and in E 6 ("publish" instead of "publishing").

The Technical Committee 09 – Chemistry recommends 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	-	30.09.2024

H Decision of the Accreditation Commission (28.06.2019)

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

The Accreditation Commission follows the assessment of the peers and supports the grammatical changes suggested by Technical Committee.

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

Degree Programme	ASIIN seal	Subject-specific Label	Maximum duration of accreditation
Ba Chemistry	With requirements for one year	-	30.09.2024

Requirements

A 1. (ASIIN 2.1) Offer a compulsory course on safety, ethics and environmental aspects.

A 2. (ASIIN 3) Make sure that all students know about writing scientific papers, citation rules, and good scientific practice.

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 5.2) Rewrite the module descriptions to include information about the responsible course coordinator, all teaching methods, form and length of exams, the students' total workload and the awarded ECTS credits.

A 5. (ASIIN 5.3) Ensure that all relevant course-related information is accessible for all stakeholders.

A 6. (ASIIN 6) Close the feedback loops and discuss with the students about the course evaluation results.

Recommendations

E 1. (ASIIN 2.1) It is recommended to develop a Master's programme in chemistry.

E 2. (ASIIN 2.1) It is recommended to send students abroad, to establish cooperations with international universities on a departmental level, to invite international guest lecturers, and to establish an international office for promoting students' exchange.

E 3. (ASIIN 2.1) It is recommended to re-establish Departments of Biology and Physics.

E 4. (ASIIN 4.3) It is recommended to increase the scope of research activities and to provide the required facilities.

E 5. (ASIIN 4.3) It is recommended to increase the number of fume hoods in the labs and follow the safety regulations more strictly.

E 6. (ASIIN 5.3) It is recommended to issue and publish a regulation on disability compensation.

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 Chemistry:

Knowledge Skills
Demonstrate knowledge and understanding of essential facts, concepts, principles and theories, perform experiments and find suitable industrial applications related to organic, inorganic, analytical and physical chemistry.
Nomenclature and use the suitable terminology of chemical compounds either by common names or systematic (IUPAC) names.
Describe the principles of quantitative and qualitative chemical analysis using conventional methods and instrumental techniques.
Intellectual Skills
Explain the nature and behavior of chemical compounds, their classification, chemical structure, reactivity, mechanisms, physical properties, and characterizations using different techniques.
Estimate chemical data by performing calculations and derivation related to general, analytical, physical, organic and inorganic chemistry.
Practical skills
Use of laboratory equipment and standard procedures & safely.
Appreciate the importance of carrying out careful and precise measurements to generate reliable data.
Prepare and separate compounds and analyze substances.
Prepare scientific reports and make oral presentations.
Use the scientific literature effectively and demonstrating scholarship in their research.
Transferable skills
Communication skills, covering both written and oral communication.
Problem-solving skills, relating to qualitative and quantitative information, extending to situations where evaluations have to be made on the basis of limited information.

The following **curriculum** is presented:

Faculty of Arts and Sciences
Department of Chemistry

University of Petra

Suggested Study Plan For a Bachelor Degree in : Chemistry 2017/2018

First Year (33 Cr. Hrs.)					
First Semester			Second Semester		
Course No.	Course Title	Cr. Hrs.	Course No	Course Title	Cr. Hrs.
101101	General Chemistry (1)	3	101102	General Chemistry (2)	3
101106	General Chemistry Lab. (1)	1	101107	General Chemistry Lab. (2)	1
103101	Calculus (1)	3	103102	Calculus (2)	3
104101	General Physics (1)	3	104102	General Physics (2)	3
9400111	Arabic Language(1)	3	104106	General Physics Lab.	1
9400121	English Language(1)	3	9400100	National Education	3
			9400109	Military Sciences	3
		16			17

Second Year (33 Cr. Hrs.)					
First Semester			Second Semester		
Course No.	Course Title	Cr. Hrs.	Course No	Course Title	Cr. Hrs.
101211	Organic Chemistry (1)	3	101212	Organic Chemistry (2)	3
101231	Inorganic Chemistry (1)	3	101213	Organic Chemistry Lab. (1)	2
101241	Analytical Chemistry	3	101232	Inorganic Chemistry (2)	3
101243	Analytical Chemistry Lab	1	101321	Physical Chemistry (1)	3
103231	Principles of Statistics	3	103222	Differential Equations	3
503101	Bilogical Science(1)	3	xxxxxx	Univ. Elective Req. (1)	3
		16			17

Third Year (34 Cr. Hrs.)					
First Semester			Second Semester		
Course No.	Course Title	Cr. Hrs.	Course No	Course Title	Cr. Hrs.
101311	Organic Chemistry (3)	3	101345	Electroanalytical Chemistry	3
101312	Organic Chemistry Lab. (2)	2	101421	Physical Chemistry (3)	3
101322	Physical Chemistry (2)	3	101422	Physical Chemistry Lab. (2)	2
101323	Physical Chemistry Lab. (1)	2	101313	Biochemistry	3
101331	Inorganic Chemistry (3)	3	xxxxxx	Dept. Elective Req. (1)	3
xxxxxx	Univ. Elective Req. (2)	3	xxxxxx	Univ. Elective Req. (3)	3
		16			17

Fourth Year (32 Cr. Hrs.)					
First Semester			Second Semester		
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
101343	Instrumental Methods of Analysis	3	101348	Synthesis & Analysis of Chemical Products	1
101344	Instrumental Methods of Analysis Lab.	1	101349	Synthesis & Analysis of Chemical Products Lab (1)	1
101445	Seminar	1	101433	Inorganic Chemistry Lab.	3
xxxxxx	Dept. Elective Req. (2)	3	101448	Research Project	2
xxxxxx	Dept. Elective Req. (3)	3	xxxxxx	Dept. Elective Req. (4)	3
xxxxxx	Univ. Elective Req. (4)	3	xxxxxx	Dept. Elective Req. (5)	3
xxxxxx	Free Req. (1)	3	xxxxxx	Free Req. (2)	3
		17			16
Total (132 Credit Hours)					