ASIIN Seal & Eurobachelor® Label

Accreditation Report

Bachelor's Degree Programme
Chemistry

Provided by
Mongolian National University, Ulaanbaatar, Mongolia

Version: September 28th 2018

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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]
Химийн ухааны бакалавр	Bachelor of Science in Chemistry	ASIIN, Euro-bachelor®	none	09
Date of the contract: 01.12.2016 **Submission of the final version of the self-assessment report:** 06.03.2018 **Date of the onsite visit:** 09.05. – 11.05.2018 **at:** Ulaanbaatar, Mongolia				
Peer panel: Prof. Dr. Evamarie Hey Hawkins, Leipzig University Prof. Dr. Klaus-Uwe Koch, University of Applied Science Recklinghausen Dr. Dietrich Scherzer, BASF SE Todsuren Ulziikhuu, Mongolian University of Science and Technology, 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
Bachelor of Science in Chemistry	Bachelor of Science	Inorganic Chemistry, Organic Chemistry, Physical Chemistry, Analytical Chemistry, Food Chemistry, Coal Chemistry, Natural Products Chemistry, Petroleum Chemistry	6	Full time	No	4 years	120 Mongolian Credit Points, 216 ECTS	Fall semester 1951

For the Bachelor's degree programme Chemistry the National University of Mongolia (NUM) has presented the following profile in its Self-Assessment Report:

"The mission of the undergraduate program in Chemistry is to provide students with foundational knowledge in the subdisciplines of chemistry as well as depth in one or more advanced areas, including cutting-edge research. Introductory course work allows students to gain hands-on experience with chemical phenomena, gather data, and propose models and explanations for their observations, thus participating in the scientific process from the start. In advanced labs and lectures, students build an in-depth knowledge of the molecular principles of chemistry empowering them to become molecular engineers comfortable with the methodologies necessary to solve complex problems and effectively articulate their ideas to the scientific community."

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

C Peer Report for the ASIIN Seal

1. The Degree Programmes: Concept, content, and implementation

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

Evidence:

- Self-Assessment Report
- Study plan
- Module descriptions
- Sample Diploma Supplement
- Webpage Department of Chemistry: http://dep.num.edu.mn/chemistry/en/
- 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 NUM 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 graduates that have the ability to solve chemical problems by applying appropriate methods. They should acquire basic theoretical knowledge and concepts of inorganic, organic, analytical, and physical chemistry. In addition, practical skills in the preparation, implementation and evaluation of chemical experiments should be obtained. Moreover, students should learn to familiarize themselves with new areas of chemistry, to be able to research specialist literature, to write scientific texts, and to present results.

Typical areas of employment are the food, chemical, pharmaceutical, and agricultural industry, as well as mining companies. 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 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 NUM have very good theoretical and practical skills and are in general better qualified in comparison to graduates from other chemistry programmes in Mongolia. Although the employers are overall satisfied with the graduates' qualification profile, they stress that the English proficiency needs to be improved. From their experience, better language skills are needed, especially if the students want to work for an internationally oriented company. The peers explicitly support this point of view and recommend including English language abilities, as the internationally accepted scientific language, in the intended learning outcomes.

The peers point out that the objectives and learning outcomes of the Bachelor's degree programme Chemistry should be accessible to all stakeholders. For example, this could be achieved by publishing them on NUM's webpage.

In addition, the peers notice that the wording of the objectives as mentioned in the Diploma Supplement is too general and does not describe the intended learning outcomes adequately. For this reason, the peers expect NUM to update the Diploma Supplement and to describe the objectives of the Bachelor's degree programme Chemistry in more detail. The presentation of the objectives in the Self-Assessment Report is a good example how they could be worded.

For the award of the ASIIN subject-specific label and the Eurobachelor® label, distinctive learning outcomes have to be achieved by First Cycle Programmes. 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 Chemistry acquire some of the necessary subject-related competences. They obtain basic theoretical knowledge in the core chemical subjects, and are qualified to carry out practical work in the field of chemistry. 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. The peers stress that the current curriculum allows the students to specialize in one out of eight chemical areas, whereby they do not acquire the necessary competences in all the core

chemical subjects (inorganic, organic, analytical and physical chemistry). This issue is discussed in more detail under criterion 2.1.

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 mostly correspond with the ASIIN Subject-Specific-Criteria (SSC) of the Technical Committee 09 – Chemistry.

The auditors judge the prerequisites for awarding the European Chemical Label (Eurobachelor®), which has also been applied for, to be partly fulfilled by the Bachelor's degree programme 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 Mongolian name of the Bachelor's degree programme Chemistry corresponds with the intended aims and learning outcomes as well as the main course language.

Criterion 1.3 Curriculum

Evidence:

- Self-Assessment Report
- Study plan
- Module descriptions
- Webpage Department of Chemistry: http://dep.num.edu.mn/chemistry/en/
- Discussions during the audit

Preliminary assessment and analysis of the peers:

NUM has developed and included in the Self-Assessment Report a comprehensive matrix that shows, which intended learning outcome should be achieved by which module. This matrix makes apparent that the objectives of the Bachelor's degree programme Chemistry

are substantiated by the modules and it is clear to the peers, which knowledge, skills and competences students will acquire in each module.

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
- Full-time undergraduate admission procedure of the National University of Mongolia
- Discussions during the audit

Preliminary assessment and analysis of the peers:

Admission to NUM depends on the grades of the high school graduates in the General Entrance Exam (GEE). This nationwide exam must be completed by all Mongolian high school graduates that want to study at a public university in Mongolia. They must achieve a threshold number of points in the GEE in order to be admitted to NUM.

Starting from the academic year of 2017-2018, tuition fee per CP for 1st year students are 80,000 MNT, for the 2nd and 3rd year students 76,400 MNT, and for 4th year students 64,300 MNT, respectively (2.800 MNT equal 1 €). During the discussion with the students, the peers learn that the students` parents usually pay the tuition fee and the amount is in general considered appropriate.

To enter the Chemistry programme, a student must complete the General Education Courses during the first two semesters of studies. A student who has earned 24 Mongolian Credit Points at the School of Arts and Sciences of NUM can choose a major. Students are ranked according to their Grade Point Average (GPA) in the first two semesters and their GEE score. The highest ranked students then can select their preferred major first. A student who fails the requirement must continue to take general courses until earning enough credits.

The peers discuss why the intake of the Bachelor's degree programme Chemistry has significantly decreased in the last few years (from 144 students in 2011/12 to 25 in 2017/18) and what the future expectations are. They learn that 25 to 30 newly enrolled students per year in the Bachelor's degree programme Chemistry are sufficient for sustaining the programme and it corresponds with the demand of the labour market. The Mongolian Ministry of Education decides every year on the number of available places for students. If demand

rises it would be possible for the Department of Chemistry to accept more (up to 100) students per year. However, NUM and the programme coordinators are not satisfied with the declining demand and try to attract more students, for example by organising the national Chemistry Olympiad and training high school teachers. In addition, the Department of Chemistry offers an open door day for high school students and has developed a flyer for advertising. Finally, NUM has decided to lower the tuition fees for all degree programmes in the area of natural sciences by 50 % for the next semester 2018/19. The peers support these efforts.

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:

NUM does not comment on criterion 1 in its final statement.

The peers consider the criterion to be mostly fulfilled.

2. The Degree Programmes: Structures, methods, and implementation

Criterion 2.1 Structure and modules

Evidence:

- Self-Assessment Report
- Study plan
- Module descriptions
- Academic Policies and Procedures of the National University of Mongolia
- Webpage Department of Chemistry: http://dep.num.edu.mn/chemistry/en/
- 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 School of Arts and Sciences of NUM.

One Mongolian Credit Point (CP) is awarded for 48 hours of students' work, including contact and self-study hours. The official conversion rate between CP and the European Credit Point Transfer System (ECTS) is 1 CP to 1.8 ECTS. This means, that 1 ECTS is awarded for 26.7 hours of students' workload.

The curriculum is divided into four sections (A, B, C, and D) and consists of 120 CP. Section A are the General Education Courses, where the students have to cover 36 CP out of the following eight areas: A1 Natural Sciences, A2 Social Sciences, A3 Humanity, A4 Individual and Society, A5 Research Methodology, A6 Writing, Reading and Communication, A7 Foreign Language/English, A8 Physical Education and Health. The single courses all encompass 3 CP, so all students enrolled at the School of Arts and Sciences have to take a total of 12 courses out of these areas. They must take two classes in areas A1, A2, A3, and A7 and one course in areas A4, A5, A6, and A8. The General Education Courses cover the first two semesters of study at the School of Arts and Sciences and only after completing at least 24 CP, students can choose their major (e.g. Chemistry).

Section B are the Core Compulsory Courses. Students in the Chemistry programme have to select Mathematics II (Linear Algebra, MATH201), General Physics (PHYS280), and Modern Physics (PHYS281) in the course of their second year. For the single Core Compulsory Course 3 CP are awarded, so section B encompasses 9 CP.

The Major Courses of Section C cover 60 CP and are subdivided into C1 Major Compulsory Courses (45 CP), C2 Speciality Compulsory Courses (9 CP) and C3 Speciality Elective Courses (6 CP). According to the study plan, the Bachelor's thesis with 3 CP is part of the Major Elective Courses, but actually, it is compulsory for all students to write a Bachelor's thesis.

In Section D, students can choose 15 CP as Free Elective Courses out of sections A, B, or C2.

The peers discuss with the programme coordinators in detail the current curriculum and possible changes. First, the peers see that there are many non-subject-specific classes in section A, such as social sciences, humanities, individual and society, and physical education and health. They are convinced that students aiming at a major in chemistry do not necessarily have to attend classes in these areas. The curriculum in the first two semesters should primarily focus on imparting fundamental competences in natural sciences and mathematics. For this reason, they suggest reducing the number of compulsory classes out of the above-mentioned areas and shifting the three compulsory classes of section B (Mathematics II, General Physics, and Modern Physics) into the first year of studies. It should be possible to apply these changes, because the Ministry of Education expects only 12 CP to be taken in the area of general education. Moreover, the peers learn that NUM is discussing about decreasing the compulsory courses in section A to 24 CP; this would leave enough room for the three classes of section B to be shifted to section A.

Secondly, the peers learn that all students have to choose one out of eight possible specialities (Inorganic, Organic, Physical, Analytical, Food, Coal, Petroleum, or Natural Products Chemistry) as Speciality Compulsory Courses. Each speciality consists of three compulsory courses (9 CP). This means that students can, for example, choose either organic or inorganic chemistry. Therefore, it is not guaranteed that the students acquire the necessary competences in the chemical core subjects.

Furthermore, the peers doubt that it is possible and useful to offer all eight specialities with only 25 new students per year. The intake of the Bachelor's programme Chemistry has decreased dramatically within the last few years (from 144 in 2011/12 to 25 in 2017/18). The programme coordinators explain that there is historical reason for offering eight different specialities. In 2014, the structure of the Chemistry programme was fundamentally changed. Before, there were eight different curricula in Chemistry, one for each speciality. The current curriculum that is in effect since 2014 reflects this old structure and was designed to incorporate all specialities. The peers stress that graduates of the Bachelor's programme Chemistry will not be accepted by Chemistry Master's programmes outside Mongolia, because they lack some essential chemical competences. They point out that on the one hand several of the speciality courses should be compulsory for all students and on the other hand 15 CP for free electives are a lot and could be reduced in favour of more compulsory chemical courses in the core areas (inorganic, organic, physical and analytical chemistry).

Thirdly, the peers point out that currently only 3 CP (5.4 ECTS) are awarded for the Bachelor's thesis. This is not in line with international standards and the Eurobachelor® framework. The Bachelor's thesis should at least encompass 8 to 10 ECTS. During the discussion with teachers and students, the peers gain the impression that the actual workload of the Bachelor's thesis is much higher than the estimated 144 hours and that awarded CP and workload do not correspond. The programme coordinators have already noticed this discrepancy and have conducted a workload survey at the beginning of 2018. Since the results were not yet available for the audit, the peers ask NUM to provide the results of the workload survey.

During the audit, the employers suggest increasing the cooperation between NUM and private companies and research facilities, e.g. by prolonging the internship and conducting more Bachelor's theses outside NUM. This will help students to improve their soft skills, get more familiar with science-related software (e.g. MATLAB), and have access to modern technical equipment. The peers support this suggestion and underline that a longer internship and more offers for external Bachelor's theses will also improve the graduates' job perspectives.

The peers discuss with the programme coordinators what possible changes in the curriculum NUM and the Department of Chemistry can decide on their own and in what areas they are restricted by governmental regulations. They learn that the Ministry of Education issues general guidelines (e.g. a minimum of 120 CP is needed for a Bachelor's degree programme), but within this framework NUM is free to design its degree programmes. There is a regular meeting with representatives of the ministry, where NUM can suggest changes to the general guidelines. As a result, the peers are convinced that the suggested changes are possible and could be implemented. In addition, the programme coordinators explain that they have already designed a new curriculum that incorporates some of the proposed reforms. For example, they also want to cancel the choice of specialities and make some of the classes compulsory. The draft has already been submitted to NUM' administration but is not approved yet. Since the Self-Assessment Report does not include the draft of the new curriculum, the peers ask NUM to submit it together with their comments on the report.

In summary, the peers expect NUM to redesign the curriculum by reducing the amount of non-subject specific classes, including more compulsory courses in the chemical core subjects, and extending the scope of the Bachelor's thesis. The aim is to better align the curriculum with international standards.

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 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 almost all teachers have international experience and contacts. However, only a few Bachelor's students spend some time abroad, usually in form of a summer school or an internship in China, Japan or South Korea. 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 and actively support the students in gaining international experience. In addition, NUM should provide more scholarships for qualified students that want to go abroad. 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.

Since NUM has the goal to become internationally more visible and wants to further internationalise its degree programmes, the peers discuss with the programme coordinators if any classes are taught in English. The programme coordinators explain that some course

material like textbooks and scientific papers are in English, but no classes are taught in English. NUM's industrial partners point out that the practical English skills of the graduates could be improved. The peers explicitly support this point of view as they see during the audit that most of the students understand what is said in English but their active speaking abilities are lacking. For this reason, the peers suggest teaching more subject-specific elements in English. For example, this could be achieved by offering poster presentations and oral presentations in English, which will also improve the students' communication skills.

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 substantial differences can be proven by the institution that is charged with recognition, in this case by NUM. By signing a learning agreement before the stay abroad, it is guaranteed that the credits acquired at a foreign university are accepted at NUM.

Criterion 2.2 Workload and credits

Evidence:

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

Preliminary assessment and analysis of the peers:
The degree programme awards 120 CP in 8 semesters. Compared to the ECTS, the total number of credit units gained in the entire degree program is equivalent to 216 (120 x 1.8) ECTS credits. At NUM, 1 CP corresponds to 48 hours of workload, and CP are allocated depending on the course type (lecture, seminar or laboratory) and self-study hours. In detail, 1 CP corresponds to 48 lecture hours (16 hours in classroom and 32 independent study hours), 48 seminar hours (32 in classroom and 16 independent study hours) and 48 laboratory hours (48 hours in classroom).

A Bachelor's degree student at NUM is expected to earn 15 CP per semester on average. The minimum amount is 12 CP and the maximum is 21 CP. The peers see that the total workload is distributed evenly between the semesters.

The Department of Chemistry decides about the awarded CP for all courses and conducted a comprehensive workload survey in 2017/18 to find out about the actual hours spent on

self-studies. According to the survey, students are spending more hours on seminar and laboratory independent studies in comparison to the estimated time. However, the independent study hours spent on lectures is much lower than the standard norm. Therefore, the programme coordinators will decrease independent studies hours for lectures and increase independent study hours for seminars. With respect to laboratory work, independent studies have to be added. As mentioned above, the discrepancy between actual workload and awarded CP especially concerns the Bachelor's thesis and the peers expect NUM to address this issue. The students agree that in total, the workload is adequate but the distribution of self-study time between the different types of courses must be adjusted according to the actual workload.

The peers discuss with the programme coordinators about the current numbers for drop-out rates and average length of studies. They learn that the table included in the Self-Assessment Report refers to the old curriculum that was in effect until 2014. The students explain that students some drop out or interrupt their studies for personal reasons e.g. founding a family. Other students change their major because they find out that chemistry does not match their interests and abilities. Although the peers gain the impression that students can finish the degree programme within the expected four years and that the drop-out rate is rather low they would like to see the exacts numbers for the current curriculum before making their final assessment on this topic. Therefore, they ask NUM to submit current numbers for drop-out rates and average length of study for the new curriculum since 2014.

In summary, the auditors conclude that there seems to be 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 lectures, seminar, practical laboratory work, internship, and final thesis are applied.

The overall learning model at NUM 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 internship is performed at industries, companies, research institutes and laboratories based on a three-way contract between university, company and student.

To help the students to achieve the intended learning outcome and to facilitate adequate learning and teaching methods, NUM provides a digital learning platform. It is used by teachers and students 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:
NUM provides a support system for all students on different levels. It includes consultations with an advisor for academic affairs about scholarships, 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 NUM. 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.

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

In its final statement, NUM point out that they have asked the Ministry of Education, Culture, Science and Sports (MECSS) to decrease the General Education Courses from 36 CP to 24 CP for all Bachelor's programmes at NUM. The peers approve this request.

Together with its final statement, NUM has provided the renewed chemistry curriculum. It will be discussed by the different panels at NUM and is planned to be put into effect from fall semester 2019/2020. NUM will increase the workload of the Bachelor's thesis to 6 CP and of the internship to 3 CP in the new curriculum. In general, the peers support the planned changes but point out that NUM must submit the new curriculum after its approval.

In addition, NUM provides additional information on drop-out rates. According to this statistical data, 81.1 % of students admitted in 2014-2015 are still studying and the drop-out rate has decreased to 8.1 % in 2014-2015 and 3.8 % in 2016-2017, respectively. Unfortunately, no information is submitted with respect to the average length of studies since the introduction of the new curriculum in 2014. For this reason, the peers issue an additional requirement, asking NUM to register, analyse, and evaluate the average length of studies.

The peers support NUM's plans for promoting academic mobility. The Department of Chemistry will offer lectures and seminars, which aim at delivering or providing up-to-date information related to scholarship, exchange program and studying abroad. They are going to activate and to extend different activities of student mobility with foreign universities collaborating with NUM and the Department of Chemistry. Finally, the Department of Chemistry is going to create an English club. The ppers point out that this club should be offerer for all students. The peers explicitly support these measures.

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
- Academic Policies and Procedures of the National University of Mongolia
- 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 attendance, participation, and preparation for the classes.

The elements used for the grading are described in detail in the course syllabus (module description). Students cannot miss more than a third of the classes, otherwise, they fail the course. Attendance is registered by the teachers and documented in NUM's electronic system.

After the first two semesters of general studies, students at NUM can choose their major and continue their academic education based on their GPA-level and acquired credits. If a student does not reach the minimum GPA-level of 1.8 and the minimum of 24 CP, he can repeat some classes in order to improve his marks and to continue his studies.

If a student fails a course, there is no possibility of a re-sit. The student may repeat the course in the next semester. As this may lead to a delay of the studies, especially if the failed course is only offered once a year, the peers suggest offering the possibility of a re-sit. In addition, the peers point out that there is no regulation for disability compensation at NUM. Since it is necessary to define rules for disability compensation measures, illness and other mitigating circumstances the peers expect NUM to address this issue and add a suitable regulation to its academic policies and procedures.

The peers discuss with the teachers, the students, and the programme coordinators the concept of grading participation. The teachers explain that the intention is to motivate the students to take actively part in the lectures e.g. by asking and answering questions. In

addition, the social competences such as the ability to work in a team and to communicate with fellow students and the teacher are criteria for assessing participation. Although, the auditors consider this assessment method unusual they see that this concept is well established at NUM and accepted by students and teachers. The students mention during the audit, that the criteria for grading participation are not transparent to them. For this reason, the peers expect NUM to define objective criteria for grading participation and to make them transparent to all students. For example, this could be achieved by issuing a guideline on grading participation.

The students confirm during the audit, that there is a general exam schedule; overlaps are usually avoided and if necessary students and teachers can decide to shift the exam date. Since the exam schedule was not available to the peers, they ask NUM to submit a sample exam schedule.

The teaching staff provides a list of possible Bachelor's thesis topics for students to choose. The Bachelor's thesis supervisor offers research guidance, ways to develop a research plan, and discusses the results with the students. Furthermore, the supervisor provides recommendation on how to write the research report and how to defend it. The Bachelor's thesis is graded by the supervisor (10 %), the opponent (10 %), and the Defense Commission (80 %). The defense includes a presentation of 10 minutes and a subsequent discussion. The Defense Commission comprises five members of the teaching staff that are currently not supervising Bachelor's theses. The peers learn that there is a new guideline for conducting and assessing the Bachelor's thesis. Since this guideline was not part of the submitted documents, the peers ask NUM to hand it in with the statement on the report.

During the audit, the peers inspect sample examination papers and final theses 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 organisation of the exams guarantees that delays in the study progress are avoided. The relevant rules for examination and evaluation criteria are available as legal documents, 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 welcome that NUM is preparing to add provision about disability compensation for exams in the Academic Policies and Procedures of NUM. NUM will also change the regulation on re-sits. If a student receives 60 % of participation and achievement score and 50 % of end-of-semester exam score, but the sum of scores is equivalence to F (fail), the teachers are authorized to assign the mark "RS" (re-sit) and the student can take a re-sit in the first month of the next semester.

The peers support these changes and ask NUM to submit the updated academic policies in the course of the fulfilment of requirements.

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 peers notice that NUM has sufficient academic staff and is well equipped for teaching. According to the Self-Assessment Report, there are currently 21 active faculty members in the Department of Chemistry (4 professors, 2 emeriti faculty, 7 associate professors, 7 senior lecturers, and 1 lecturer). They include 2 men and 19 women. The academic staff members are supported by a department secretary and 6 academic and service assistants.

At NUM, staff members have different academic positions based on research activities, publications, academic education, supervision of students, and other supporting activities. For example, a full professor needs to hold a PhD degree. In addition, the responsibilities and tasks of a staff member with respect to teaching, research, and supervision depend on the academic position. Almost all staff members have permanent contracts, but every

three years all teachers have to reapply for their position. Based on performance indicators (e.g. research activities, course evaluations) staff members can be up- or down graded.

Approximately, 50 % of the staff members at the Department of Chemistry have done their PhD abroad and almost all have spent some time at an international university. During the discussion with the peers, some teachers criticise that the teaching load is too high and that there is not enough time for conducting research activities. The peers learn that there is some flexibility between the hours spend on teaching, research, and supervision. Therefore, some teachers can apply for a lower teaching load and increase their research activities. The academic staff also teaches in the Master's and PhD programme in Chemistry and gives classes for other majors (e.g. biology and physics). Overall, the peers consider the teaching load to be adequate.

In summary, the peers confirm that the composition, scientific orientation and qualification of the teaching staff is suitable for successfully implementing and sustaining the Chemistry programme. There are enough resources available for administrative tasks and supervision and guidance of the students. The only weak point they identify with respect to the qualification of the teaching staff is the fact that almost all of the staff members are graduates from NUM. For this reason, they recommend also hiring new staff members that graduated from other universities.

The open-minded atmosphere among the staff members and their dedication to further developing the Chemistry programme impresses 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 NUM, there are sufficient offers and support mechanisms available for teacher who wish to further develop their professional and teaching skills. For example, there is a Teaching Development Center at NUM that offers classes for faculty members. In addition, enough funds are available for spending time abroad e.g. for attending seminars, conferences or workshops or for taking part in 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.

For example, workshops are offered regularly according to the needs of the staff members. In addition, more experienced teachers tutor young lecturers.

A paid leave of absence for participating in international research projects is possible, and several staff members have international contacts with universities in Germany, Russia, China, Japan or South Korea. The international experience of the staff members is one of the strong points of the Chemistry 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 NUM library in order to assess the quality of infrastructure and technical equipment. They notice that there are no apparent bottlenecks due to missing equipment or a lacking infrastructure.

However, the peers point out that some sophisticated and modern technical equipment is missing. The programme coordinators are aware of this problem and cooperate with governmental research laboratories in order to conduct some of the practical courses there. During the internship, students can use facilities from private companies with more sophisticated technical equipment. This is one of the reasons why the peers suggest increasing the cooperation with private companies and prolonging the internship.

Every teacher receives an annual grant for spending on the laboratories or on teaching assistants (2 mill. MNT for professors, 1 mill. MNT for associate professors, 800,000 MNT for senior lecturers). These funds are sufficient for providing all necessary equipment, but leave no room for purchasing advanced technical equipment like an atomic absorption spectrometer for analytical chemistry or an NMR spectrometer (benchtop) for organic chemistry. In addition, the peers notice that, in general, there are no replacement instruments available especially for the laboratory courses. If one instrument breaks down it cannot be repaired at NUM but must be sent to a maintenance company. This takes some time, and in the meanwhile the students cannot conduct the concerned experiment or the teachers cannot continue their research activities. For this reason, the peers recommend purchasing some modern technical equipment and providing back-up instruments.

With respect to safety regulations, the peers see that there is room for improvement at the Department of Chemistry. While visiting the laboratories they notice that the safety measures are not up to international standards. This especially concerns missing emergency exit signs and eye showers. Students and lab personnel need to wear safety glasses, the floor material in the laboratories is inflammable, there are threshold barriers at the laboratory doors, and some fire extinguishers are located behind doors or are mounted out of reach on the wall. In addition, chemicals are not always stored adequately, and there is no functioning system for chemical or organic waste disposal. The peers expect NUM to address these issues and to improve the safety measures in the laboratories.

The peers are impressed by the new research laboratories in the upper floors of the new library. Some of the laboratories are already fully equipped; some still need to be furnished. It is planned to use these new laboratories also for teaching Bachelor's students. The peers are convinced that this will help to further improve the quality of the practical education in the Chemistry programme.

The peers discuss with the programme coordinators how NUM is funded and how the budget is distributed between the different departments. They learn that about 80 % of NUM's budget derives from tuition fees, the rest is provided by the Ministry of Education mainly for financing research projects and purchasing expensive technical equipment. Every year each department has to submit a financial plan and NUM's management then decides about the funding. Since the number of chemistry students is rather low, the income from tuition fees is not enough for sustaining the Chemistry programme. However, the difference is compensated by other departments (e.g. social sciences, humanities) where the costs are much lower and the number of students is significantly higher. As a result, there are sufficient financial resources available for adequately conducting the Bachelor's degree programme Chemistry.

The new NUM 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 satisfied with the available literature and services provided by the library. They only suggest prolonging the library opening hours during the exam weeks, because the students use the learning rooms and places in the library for preparing for the final exams. In addition, the peers notice that only very few study places are available to the students in the Department of Chemistry. Although, this deficit is compensated by the working places in the library, the peers think it would be useful to provide more learning and study opportunities in the Department of Chemistry.

The students express their general satisfaction with the available resources and conditions of studying, thereby confirming the positive impression of the peer group.

The auditors conclude that 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 acknowledge that the Department of Chemistry has arranged several activities for improving laboratory safety: First aid kits have been installed in every laboratory, fire protection instruments have been replaced, and eyewash and shower equipment has been bought. The peers welcome these activities, but ask NUM to further improve the safety measures and to align them with international standards.

The peers consider criterion 4 to be mostly fulfilled.

5. Transparency and documentation

Criterion 5.1 Module descriptions

Evidence:

- Self-Assessment Report
- Study plan
- Module descriptions
- Webpage Department of Chemistry: http://dep.num.edu.mn/chemistry/en/
- Discussions during the audit

Preliminary assessment and analysis of the peers:

The auditors confirm that the module descriptions are accessible to all students and teachers via the university`s homepage. In general, the module descriptions include all necessary information about the course`s objectives and content, its link to the programme objectives as well as prerequisites, workload, teaching methodology, exam requirements, literature and teaching staff.

The only weak points the peers identify is the missing description of the Bachelor's thesis and the fact that the laboratory courses do not include any time for self-studies. The peers expect NUM to submit the missing module description of the Bachelor's thesis and to update the descriptions of the laboratory courses.

Criterion 5.2 Diploma and Diploma Supplement

Evidence:

- Self-Assessment Report
- Sample Diploma Supplement
- Sample Bachelor Diploma

Preliminary assessment and analysis of the peers:
The peer group notices that a Diploma Supplement is only issued upon request by the student. This practice needs to be changed, because it is necessary to automatically hand out a Diploma Supplement to every graduate.

The Diploma Supplement contains information about the structure, content and the obtained results. However, the peer group points out that the wording of the description of the intended learning outcomes is too general and does not adequately reflect the content of the Chemistry programme. For this reason, the peers expect NUM to update the description of the intended learning outcomes in the Diploma Supplement.

Criterion 5.3 Relevant rules

Evidence:

- Self-Assessment Report
- Webpage Department of Chemistry: http://dep.num.edu.mn/chemistry/en/
- Webpage of NUM: http://www.num.edu.mn/en/content.htm?mid=5578

Preliminary assessment and analysis of the peers:
The auditors confirm that the rights and duties of both NUM and the students are clearly defined and binding. All rules and regulations are published on the university's website and hence available to all relevant stakeholders.

The only critical point is the accessibility of the English webpage of the Department of Chemistry. It can only be found with difficulty, because it must be accessed via NUM's homepage and the information there is only in Mongolian.

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

The peers welcome that NUM has updated the Diploma Supplement, including learning outcomes of the chemistry degree programme, and will hand it out to every graduate from spring semester 2018. Nevertheless, the peers would like to see a sample Diploma Supplement and issue a requirement to this respect.

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 Policies and Procedures of the National University of Mongolia

Preliminary assessment and analysis of the peers:
The auditors discuss the quality management system at NUM with the programme coordinators. They learn that there is a continuous process in order to improve the quality of the degree programme, carried out through internal and external evaluation.

This process has only been started in 2017 as NUM has begun to reform its general concept of quality management by introducing comprehensive surveys. Internal evaluation of the quality of the Chemistry programme is mainly provided through student and alumni surveys. The students give their feedback on the courses by filling out a questionnaire on a paper and pencil basis. Furthermore, there is a complaints box for the students that can be used for suggestions or criticism. The peers are surprised that the questionnaires are collected by the teacher and not a neutral person. In addition, the students are not informed about the surveys' results, and there is not yet an established process on analysing the students' feedback and on using it for further developing the degree programme.

External quality assessment of the degree programme is provided by the accreditation of the degree programme by the National Council for Higher Education Accreditation of Mongolia.

The peers learn from NUM's partners from public institutions and private companies that they meet once a year with faculty members and discuss the needs and requirements of the job market and possible changes to the degree programme. As the peers consider the input of the employers to be very important, they appreciate their involvement.

The auditors gain the impression that the quality management system at NUM and the Department of Chemistry is still in a developmental state. The responsible institutions have been established and the necessary tools exist, but practical implementation is lacking. The programme coordinators are aware of these deficits and ensure that they will improve the quality management system. The peers stress that it is necessary to develop a culture of quality assurance with the involvement of all stakeholders in the process.

In summary, the peers expect that questionnaires are not collected by the teacher, students are informed about the results, and students' feedback is analysed and used for further developing the degree programme.

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

NUM explains in its statement that surveys are conducted through SISI at the end of each semester to improve the quality of courses, develop teaching staff's teaching methodology, and to obtain necessary information to improve the quality of learning environment. The questionnaire is developed by the Academic Affairs Office and provided to students via the SISI information system.

In 2017, the Department of Chemistry conducted an examination of internal quality assessment. Students' performances were analysed in order to reveal any misunderstandings and misconceptions. Moreover, while carrying out the item analysis, the teaching team was able to come up with ideas for improving teaching methodolgoies and course content.

The peers still think that it is necessary to ensure that the students get a feedback about the results of the teaching evaluations and that the questionnaires are not collect by the teacher.

The peers consider criterion 6 to be mostly fulfilled.

D Additional Documents

Before preparing their final assessment, the panel asks 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:

1. Draft of the new curriculum
2. Module description Bachelor's thesis
3. Guideline for preparing the Bachelor's thesis
4. Results of the workload survey
5. Drop-out rates and average length of study for the new curriculum since 2014
6. Sample exam schedule

E Comment of the Higher Education Institution (23.06.2018)

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

- 1. Draft of the new curriculum
- 2. Module description Bachelor's thesis
- 3. Guideline for preparing the Bachelor's thesis
- 3a. Requirements for preparing manuscript of bachelor's thesis and its submission
- 3b. Requirements on the content and structure of bachelor's thesis
- 3c. Principles of assessment on bachelor's thesis
- 4. Results of the workload survey
- 5. Drop-out rates and average length of study for the new curriculum since 2014
- 6. Sample exam schedule
- 7.Sample lab description

F Summary: Peer recommendations (14.07.2018)

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

Degree Programme	ASIIN-seal	Subject-specific label	Maximum duration of accreditation
Ba Chemistry	With requirements for one year	Eurobachelor® if all requirements are fulfilled	30.09.2024

Requirements

A 1. (ASIIN 1.1) Make the intended learning outcomes accessible to all stakeholders.

A 2. (ASIIN 1.1) Update the description of the intended learning outcomes in the Diploma Supplement.

A 3. (ASIIN 1.3) Redesign the curriculum with the aim to reduce the amount of non-subject specific classes and to better align it with international standards.

A 4. (ASIIN 2.2) Register, analyse, and evaluate the average length of studies.

A 5. (ASIIN 3) Extend the scope of the Bachelor's thesis so that it is comparable to international standards.

A 6. (ASIIN 3) Issue a regulation on disability compensation.

A 7. (ASIIN 3) Make the criteria for grading participation transparent to the students.

A 8. (ASIIN 4.3) Improve the safety standards in the laboratories.

A 9. (ASIIN 5.2) Hand out a Diploma Supplement to every student upon graduation.

A 10. (ASIIN 6) Ensure that the students get a feedback about the results of the teaching evaluations and that the teacher does not collect the questionnaires.

Recommendations

E 1. (ASIIN 1.3) It is recommended to extend the internship.

E 2. (ASIIN 2.1) It is recommended to improve the students' English proficiency.

E 3. (ASIIN 4.3) It is recommended to purchase modern technical equipment for the laboratories and to provide back-up instruments.

E 4. (ASIIN 6) It is recommended to better use the results of the surveys for further improving the degree programme.

G Comment of the Technical Committee 09 – Chemistry (17.09.2018)

Assessment and analysis for the award of the ASIIN seal:

The Technical Committee discusses the procedure. Since there is the potential to change the curriculum according to the proposals of the evaluators within the deadline for fulfilling the requirements, the Technical Committee agrees with the corresponding requirements.

Assessment and analysis *for the award of the Eurobachelor® label:*

The Technical Committee is of the opinion that the desired learning outcomes do not yet correspond to the fields of knowledge defined by ECTN. Therefore, they postpone the decision for the award of the Eurobachelor® label until the requirements are fulfilled.

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

Degree Programme	**ASIIN seal**	**Subject-specific labels**	**Maximum duration of accreditation**
Ba Chemistry	With requirements for one year	Eurobachelor® if all requirements are fulfilled	30.09.2024

H Decision of the Accreditation Commission for Degree Programmes (28.09.2018)

Assessment and analysis for the award of the ASIIN seal:

The Accreditation Commission discusses the procedure especially about the rather high amount of requirements and if NUM will be able to fulfil all requirements within the next nine months. Since NUM has already prepared new study plans and will submit them to the university's administration in due time, the Accreditation Commission think that it will be possible to implement the necessary changes within the vailable time. For this reason, they agree with the proposed requirements and recommendations. They only make a small change to requirement A 10.

Assessment and analysis for the award of the Eurobachelor® *label:*

The Accreditation Commission agrees with the peers and the Technical cCommitee and postpones the decision about the award of the Eurobachelor until all requirements are fulfilled.

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

Degree Programme	ASIIN seal	Subject-specific labels	Maximum duration of accreditation
Ba Chemistry	With requirements for one year	Eurobachelor® if all requirements are fulfilled	30.09.2024

Requirements

A 1. (ASIIN 1.1) Make the intended learning outcomes accessible to all stakeholders.

A 2. (ASIIN 1.1) Update the description of the intended learning outcomes in the Diploma Supplement.

A 3. (ASIIN 1.3) Redesign the curriculum with the aim to reduce the amount of non-subject specific classes and to better align it with international standards.

A 4. (ASIIN 2.2) Register, analyse, and evaluate the average length of studies.

A 5. (ASIIN 3) Extend the scope of the Bachelor's thesis so that it is comparable to international standards.

A 6. (ASIIN 3) Issue a regulation on disability compensation.

A 7. (ASIIN 3) Make the criteria for grading participation transparent to the students.

A 8. (ASIIN 4.3) Improve the safety standards in the laboratories.

A 9. (ASIIN 5.2) Hand out a Diploma Supplement to every student upon graduation.

A 10. (ASIIN 6) Ensure that the students get a feedback about the results of the teaching evaluations and that they are conducted confidentially.

Recommendations

E 1. (ASIIN 1.3) It is recommended to extend the internship.

E 2. (ASIIN 2.1) It is recommended to improve the students' English proficiency.

E 3. (ASIIN 4.3) It is recommended to purchase modern technical equipment for the laboratories and to provide back-up instruments.

E 4. (ASIIN 6) It is recommended to better use the results of the surveys for further improving the degree programme.

Appendix: Programme Learning Outcomes and Curricula

According to the Self-Assessment Report, the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor degree programme Chemistry:

Chemistry major competency	Learning outcomes of the degree program (PLOs)
1. SPECIALIST COMPETENCIES	
1.1 To solve chemistry problems using mathematics and physics methods and model data derived from experiments.	1.1.A To have skills that use principles of mathematics and physics to solve chemistry problems.
	1.1.B To produce solutions using physics and mathematical models.
1.2 To verify basic theoretical knowledge and concepts of inorganic, organic, analytic and physics chemistry	To hold a view regarding organic and inorganic substance characteristcs and structures.
	1.2.A To know the fundamentals and laws of the Science of Chemistry.
	1.2.B To use basic methods of chemistry and physics to analyze phenomenon in surrounding environment.
1.3 To learn basic techniques and principles to work in a laboratory; to show safe laboratory work skills and to conduct chemical analysis independently.	1.3.A To have the skills to independently work in a chemistry laboratory and conduct chemistry analysis.
	1.3.B To know direct and indirect methods of defining key indicators of chemistry systems (pH, melting point, absorption).
	1.3.C To have acquired skills to develop numerical measurement values.
	1.3.D To have acquired safe handling skills when working with chemical substances, agents and laboratory equipments.
1.4 To develop problem solving skills in Chemistry and to acquire skills to solve new problems.	1.4.A To apply acquired knowledge and skills to examine and evaluate chemical reaction and changes.
	1.4.B To be able to judge, monitor and self-assess during learning process
1.5 To have analyzing and critical thinking skills to collect research data, analyze and interpret.	1.5.A To read a suitable research paper, acquire necessary information and have skills to analyze information.
	To have the skills to collect, anlayze and interpret experimental data.
1.6 To locate research topic, formulate necessary activities to solution and express information regarding science of chemistry verbally and in written form.	1.6.A To have located research topic and formulated necessary activities to successfully find solutions.
	1.6.B To be able to write laboratory report, to present verbally, with or without a presentation and write research papers; To be able to communicate verballly or in writing.
2. SOCIAL COMPETENCIES	
2.1 To have knowledge of new developments and improvements in natural science, humanites and social science sectors	2.1.A To have deep knowledge of Mongolian history.
	2.1.B To have knowledge about basic economic theory and have tangible understanding about global social, political and economic situation.
	2.1.C To be able to communicate with specialists in the field of psychology and ethics.

2.2 To have basic knowledge of surrounding environment, sustainable development issues and laws related to the issues, whilst approaching these issues from a scientific view.	2.2.A	To know the method of eliminating chemical waste in accordance with related rules and procedure.
	2.2.B	To have basic legal knowledge to problem solve issues that arise within the context of self concerning surrounding environment and sustainable development.
2.3 To have skills to discuss and analyze the economic, social and cultural outcomes of development of chemistry and other sectors with others.	2.3.A	To have skills to assess research work of global context and have foreign language skills to communicate with others
	2.3.B	To be able to transfer chemistry related information to other specialists of different science fields.
	2.3.C	To know the ethical characteristis and cultural contrast of different groups of people.
2.4 To think and imagine in terms of scientific inquiry and to acknowledge the ethical and standard norms behind reasoning.	2.4.A	To have skills to think and imaginein terms of scientific inquirey and fully acknowledge the ethical and standard norms behind reasoning when commuicating with colleagues and other people.
2.5 To know the core principles used for implementing a project; To develop a responsible project management.	2.5.A	To know the core principles of writing, implementing and managing a project.
2.6 To be prepared to work in a professional working environment.	2.6.A	To implement and adhere to work place safety rules and measures.
	2.6.B	To have been introduced to training/industrial setting or professional environment.
	2.6.C	To have acquired practice completing specific tasks.
	2.6.D	To be able to inform, report, review and edit about performed tasks.
3. GENERIC COMPETENCIES		
3.1 To have intersectoral knowledge and skills, such as economics, ethics, philosophy etc.	3.1.A	To be able to use intersectoral knowledge and skills, such as economics, ethics and philosophy when solving chemistry problems.
3.2 To have skills for life-long learning.	3.2.A	To have confidence that the knowledge, skills and approach acquired throught the science of chemistry will become the roots for further learning.
3.3 To have skills to work independently and in teams to make joint decisions.	3.3.A	To have skills to work in a team and make joint decisions.
	3.3.B	To have skills to work independently and think creatively in learning or work environments.
3.4 To work in an internet environment using information technology and computer; To be able to develop chemistry information using application softwares.	3.4.A	To have skills to search for necessary information from the internet and use application softwares to develop the information.

The following **curriculum** is presented:

No		Course codes	Courses	CP	Semester
A. GENERAL EDUCATION COURSES				**36**	
1	1		A1. Natural sciences	6	I-II
2	2		A2. Social sciences	6	I-II
3	3		A3. Humanity	6	I-II
4	4		A4. Individual and society	3	I-II
5	5		A5. Research methodology	3	I-II
6	6		A6. Writing, reading and communication	3	I-II
7	7		A7. Foreign language/English	6	I-II
8	8		A8. Physical education and health	3	I-II
Note: A total 36 credit points must be collected by selecting the courses in each subject area of general education courses according to the curriculum requirements of NUM.					
B. CORE COMPULSORY COURSES				**9**	
B2. ELECTIVE CORE COURSES (FACULTY REQUIRENMENTS)				**9**	
9	1	MATH201	Mathematics II (Linear algebra)	3	II-III
10	2	MATH202	Mathematics III (Multi variables function)	3	II-III
11	3	CHEM205	General chemistry	3	III, IV
12	4	PHYS280	General physics	3	III, IV
13	5	GEOL102	General geology	3	III, IV
14	6	BIOL200	General biology	3	III, IV
15	7	PHYS281	Modern physics	3	III, IV
16	8	GEOG200	Basics of nature and space utilization	3	III, IV
C. MAJOR COURSES				**60**	
C1. MAJOR COMPULSORY COURSES				**45**	
17	1	MATH222	Mathematics for chemistry	**3**	III-IV
18	2	CHEM201	General chemistry I	**3**	III-IV
19	3	CHEM202	General chemistry II	**3**	IV
20	4	CHEM302	Analytical chemistry	**3**	V
21	5	CHEM204	Organic chemistry I	**4**	IV-V
22	6	CHEM301	Organic chemistry II	**4**	V
23	7	CHEM312	Instrumental methods of analysis	**4**	VI
24	8	CHEM303	Physical chemistry I	**4**	V-VI
25	9	CHEM304	Computational chemistry	**3**	VI
26	10	CHEM305	Inorganic chemistry I	**4**	VI
27	11	BIOC300	Biochemistry	**4**	V
28	12	INTE300	Internship	**2**	VI
29	13	CHEM307	Physical chemistry II	**4**	VI

SPECIALTY COMPULSORY COURSES				**9**	
C1.1. Inorganic chemistry				**9**	
30	1	CHEM401	Inorganic chemistry II	3	VII
31	2	CHEM402	Element organic chemistry	3	VII
32	3	CHEM403	Synthesis of inorganic compounds	3	VII
C1.2. Organic chemistry				**9**	
33	1	CHEM404	Spectroscopy of organic compounds	3	VII
34	2	CHEM405	Organic synthesis	3	VII
35	3	CHEM406	Polymer chemistry	3	VII
C1.3. Analytical chemistry				**9**	
36	1	CHEM407	Basics of chemical metrology	3	VII
37	2	CHEM408	Analytical environmental chemistry	3	VII
38	3	CHEM409	Concentration and separation methods	3	VII
C1.4. Physical chemistry				**9**	
39	1	CHEM410	Electrochemistry	3	VII
40	2	CHEM411	Surface and colloid chemistry	3	VIII
41	3	CHEM412	Molecular structure and spectroscopy	3	VII
C1.5. Food chemistry				**9**	
42	1	CHEM413	Food chemistry and analysis	3	VII
43	2	CHEM414	Food technology	3	VIII
44	3	CHEM415	Food safety and nutrition	3	VII
C1.6. Natural products' chemistry				**9**	
45	1	CHEM416	Chemistry of natural compounds	3	VII
46	2	CHEM417	Pharmachemistry and analysis	3	VII
47	3	CHEM418	Bioorganic chemistry	3	VIII
C1.7. Petroleum chemistry				**9**	
48	1	CHEM419	Chemistry and analysis of petroleum	3	VII
49	2	CHEM420	Technology of oil refining	3	VIII
50	3	CHEM421	Petrochemical synthesis	3	VIII
C1.8. Coal chemistry				**9**	
51	1	CHEM422	Coal chemistry	3	VII
52	2	CHEM423	Coal conversion technology	3	VII
53	3	CHEM424	Coal analysis	3	VIII
C2. SPECIALTY ELECTIVE COURSES				**6**	
54	1	CHEM310	History of chemistry	2	VIII
55	2	CHEM425	Basics of nanochamistry and supramolecular chemistry	3	VIII
56	3	CHEM426	Introduction of geochemistry	3	VIII
57	4	CHEM427	Environmental chemistry	3	VIII
58	5	CHEM428	Chemistry of non-ferrous and rare elements	3	VIII
59	6	CHEM429	Catalysis	3	VIII
60	7	CHEM430	Food biotechnology and microbiology	3	VII
61	8	CHEM431	Chemistry of heterocyclic compounds	3	VIII
62	9	CHEM432	Phytochemistry and useful plants	3	VIII
63	10	CHEM433	Clean coal technology	3	VIII
64	11	CHEM434	Fuels and lubricants chemistry	3	VIII
65	12	THES400	Thesis	3	VII*-VIII
FREE ELECTIVE COURSES				**15**	
Total credits				**120**	