



ASIIN Seal & Euromaster[®] Label

Accreditation Report

Master's Degree Programmes
Pharmaceutical Chemistry
Analytical Chemistry

Provided by
Institut Químic de Sarrià, Ramon Llull University,
Barcelona

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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
Master Universitario en Química Farmacéutica	University Master's Degree in Pharmaceutical Chemistry	ASIIN, Eurromaster®	-	09
Master Universitario en Química Analítica	University Master's Degree in Analytical Chemistry	ASIIN, Eurromaster®	-	09
Date of the contract: 23.10.2017 Submission of the final version of the self-assessment report: 12.03.2018 Date of the onsite visit: 10.04. – 11.04.2018 at: Barcelona				
Peer panel: Prof. Dr. Juergen Grotemeyer, Christian-Albrechts-University Kiel Prof. Dr. Gerd Knupp, University of Applied Sciences Bonn-Rhein-Sieg Prof. Dr. Gerhard K. E. Scriba, Friedrich-Schiller-University Jena Dr. David Gutiérrez, Director of Business Unit, LEITAT Technological Center Carla Casadevall, PhD student, ICIQ (Institute of Chemical Research of Catalonia) - URV (University Rovira i Virgili)				
Representative of the ASIIN headquarter: Rainer Arnold				
Responsible decision-making committee:				

¹ ASIIN Seal for degree programmes;

² TC: Technical Committee for the following subject areas: TC 09 – Chemistry

A About the Accreditation Process

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	

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
Master Universitario en Química Farmacéutica	Master of Science M.Sc.	-	7	Full time	no	3 Semester	90 ECTS	September, 2014/15
Master Universitario en Química Analítica	Master of Science M.Sc.	-	7	Full time	no	3 Semester	90 ECTS	September, 2014/15

³ EQF = The European Qualifications Framework for lifelong learning

For the Master's degree programme Pharmaceutical Chemistry (MQF) Institut Químic de Sarrià (IQS) has presented the following profile in the Self-Assessment Report:

"MQF is oriented to produce graduates with an advanced level of knowledge and open doors of companies and leading research centers not only in Spain but in all countries participating in the European Higher Education Area (EHEA). In this sense, the objective of MQF is to train professionals and researchers with a profile applied to research and development of products, processes and services in the pharmaceutical industry. These professionals and researchers must have the following characteristics:

- a) Advanced knowledge of the different disciplines of Pharmaceutical Chemistry enabling them to identify and reasoning problems, develop and implement original ideas and integrate new knowledge throughout their professional lives.*
- b) Domain of chemical and management tools for research, development and production of drugs.*
- c) Knowledge of the pharmaceutical industry and new trends in the use of Pharmaceutical Chemistry.*
- d) Skills in managing knowledge and ability to lead projects in the pharmaceutical field*

Therefore, graduates of MQF can work professionally in various industries, in positions of academic and industrial research, development and production in the pharmaceutical, biomedical industry and related sectors. MQF gives access to doctoral programs."

For the Master's degree programme Analytical Chemistry (MQA) Institut Químic de Sarrià (IQS) has presented the following profile in the Self-Assessment Report:

"The prospective students of the MQA are mainly graduates in Chemistry or equivalent studies. The objective of MQA is to train professionals and researchers with a profile applied to research and development of products, processes and services in different industrial sectors related with the analytical chemistry. These professionals and researchers must have the following characteristics:

- a) Advanced knowledge of the different disciplines of Analytical Chemistry, with particular incidence in the environmental, food, pharmaceutical and industrial areas, which allow them to identify and discuss on problems, develop and apply original ideas and integrate new knowledge during their professional life
- b) Knowledge of chemical and management tools for research, development and production of chemical products and services
- c) Knowledge of the industrial sectors and new trends in the use of analytical chemistry

d) Skills in Knowledge Management and ability to lead projects

MQA graduates can work in several industrial sectors, in positions of academic or industrial research, development and production in chemical, food, environmental, pharmaceutical, diagnosis, materials, biomedicine industries, among other sectors. MQA graduates can access directly to doctoral programs.”

C Peer Report for the ASIIN Seal

1. The Degree Programme: Concept, content & implementation

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

Evidence:

- Objectives-Module-Matrix
- Self-Assessment Report
- Study plans
- Module descriptions
- Webpage Ma Pharmaceutical Chemistry <https://www.iqs.edu/en/masters/master-pharmaceutical-chemistry>
- Webpage Ma Analytical Chemistry <https://www.iqs.edu/en/masters/master-analytical-chemistry>

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 Master's degree programmes Pharmaceutical Chemistry and Analytical Chemistry as defined by IQS correspond with the competences as outlined by the SSC. They come to the following conclusions:

The intended learning outcomes of the Master's degree programme Pharmaceutical Chemistry cover the mastery of advanced chemical and management tools for research, development, and production of drugs. This includes acquiring advanced knowledge in organic synthesis, process chemistry, drug analysis and delivery, molecular design, pharmaceutical technology, pharmacology, and photochemistry. In addition, the graduates should know about new trends in using pharmaceutical substances, be able to lead projects in the pharmaceutical field, to identify and solve advanced problems, and to assimilate new knowledge throughout their professional career.

The Master's degree programme Pharmaceutical Chemistry aims at training professionals and researchers with the ability to develop new products, processes and services in all areas related to pharmaceutical chemistry.

According to the Self-Assessment report, graduates of the Master's degree programme Pharmaceutical Chemistry can find adequate jobs in areas such as the chemical, pharmaceutical or biomedical industry, in research centres, universities, and public administration.

The purpose of the Master's degree programme Analytical Chemistry is to train graduates with a scientific focus in the field of modern, instrumental analytics. To this end, the students should acquire advanced knowledge of structural characterisation, chromatography, spectrometry, and electroanalysis. In addition, they should be able to analyse pharmaceutical and food products enabling them to take on management and research functions after successfully completing their studies. Finally, graduates should be qualified to plan, carry out and evaluate research projects and to present the results.

Typical areas of employment are the food, chemical, pharmaceutical, and agricultural industry, biomedical and environmental companies. In addition, the graduates have job opportunities in research centres, universities, and public administration.

The auditors hold the view that the objectives and intended learning outcomes of both Master's degree programmes under review are reasonable and well founded.

For the award of the ASIIN subject-specific label and the Euromaster® label, distinctive learning outcomes have to be achieved by Second 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. Since both Master's degree programmes under review have a focus on the different areas of chemistry they are overseen by the Technical Committee 09 - Chemistry.

Based on the Self-Assessment Report and the discussions during the on-site-visit, the peers see that graduates of both Master's degree programmes acquire the necessary subject-related competences. They have advanced their knowledge in the core or interdisciplinary chemical subjects, and are qualified to carry out scientific independent work in the field of chemistry. Furthermore, graduates are able to solve subject-relevant problems, can present the results, have trained their analytical and logical abilities, and have an awareness of possible social, ethical and environmental effects of their actions. During the course of their studies, the students have also acquired the necessary social competences, such as the ability to work in a team, to present and discuss results, and to communicate with other experts. Therefore, graduates are also prepared to take on leadership responsibilities.

During the discussion with the auditors the employers and IQS's partners from industry stress their satisfaction with the graduates' qualification profile. In the course of their studies, students learn about project management and property rights and acquire solid experience in practical work. The employers stress the advanced practical skills of IQS's graduates as a very positive aspect of the degree programmes. As a consequence, graduates can adjust to working in private companies very quickly and have all necessary qualifications needed for starting a successful professional career.

In summary, the auditors are convinced that the intended qualification profiles of both Master's degree programmes under review allow graduates to take up an occupation, which corresponds to their qualification. The degree programmes are designed in such a way that they meet the objectives set for them. The peers judge the objectives and learning outcomes of the Master's degree programmes suitable to reflect the intended level of academic qualification (EQF 7) and to correspond with the ASIIN Subject-Specific-Criteria (SSC) of the Technical Committee 09 – Chemistry. IQS has provided Objectives-Module Matrices for both programmes that make transparent how the SSC are reflected in the respective curriculum. The analysis of the matrices confirm that the degree programmes are in line with the SSC and all subject-specific criteria are adequately represented. The peers appreciate that IQS aims for high standards as to provide their graduates with promising prospects in the national and international job market as well as a good starting point for continuing their academic education in the course of a PhD-programme.

The auditors judge the prerequisites for awarding the European Chemical Label (Euro-master®), which has also been applied for, to be fulfilled by both Master's degree programmes under review.

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 Spanish names of the Master's degree programmes correspond with the intended aims and learning outcomes as well as the main course language.

Criterion 1.3 Curriculum

Evidence:

- Objectives-Module-Matrix
- Self-Assessment Report
- Study plans
- Module descriptions
- Webpage Ma Pharmaceutical Chemistry <https://www.iqs.edu/en/masters/master-pharmaceutical-chemistry>
- Webpage Ma Analytical Chemistry <https://www.iqs.edu/en/masters/master-analytical-chemistry>

Preliminary assessment and analysis of the peers:

The Master's degree programmes Pharmaceutical Chemistry and Analytical Chemistry are both offered by IQS School of Engineering (IQS-SE).

The curriculum of the Master's degree programme Pharmaceutical Chemistry consists of 90 ECTS credits, with 50 ECTS credits for compulsory courses, 10 ECTS credits for electives, and 30 ECTS credits for the Master's thesis (Trabajo de final de Master, TFM).

The compulsory courses include the "Transversal Module" that is offered in the first semester with courses in "Pharmaceutical Chemistry" and "Project Management". It provides an overview of the research and development processes of drugs, imparts knowledge of project management techniques, and how to work successfully in a team. Also part of the curriculum in the first semester is the compulsory module "Drug Research Module" that includes courses in "Molecular Design", "Advanced Organic Synthesis", "Identification and Structural Characterization" and "Integrated Laboratory I". In the course of these modules students acquire the theoretical knowledge and practical abilities needed for drug research in its different phases such as design and selection, synthesis of candidate molecules, and spectroscopic techniques of identification and characterization. The second semester consists of the "Elective Subject Module" and the compulsory module "Drug Production Module" with courses in "Process Chemistry", "Drug Analysis", "Quality Management", and "Integrated Laboratory II".

The "Drug Production Module" aims at providing students with specific knowledge of the industrial production of drugs. Specifically, the students acquire the ability to develop processes of organic synthesis on an industrial scale within the environment of the pharmaceutical industry.

In the module “Elective Subject Module” two elective courses can be chosen by the students in accordance with their areas of interest. The catalogue of elective courses in the Master's degree programme Pharmaceutical Chemistry includes, among others, the following: “Photochemistry”, “Pharmacology for Chemists”, “Experimental Design”, “Regulatory Affairs in the Pharmaceutical Industry”, and “Advanced Drug Delivery Systems”. All compulsory and elective courses encompass five ECTS credits.

In the final semester of the Master's degree programme Pharmaceutical Chemistry an individual research project (TFM) is conducted in a research group under the tutelage of a professor. The TFM may be prepared in other institutions outside IQS, like other national or foreign universities, public and private research centres, or chemical companies. It is concluded with a written report and an oral defence before an evaluation panel.

The curriculum of the Master's degree programme Analytical Chemistry consists of only compulsory modules (60 ECTS credits) and the Master’s thesis (30 ECTS credits). The compulsory modules are divided into three categories: “Technological Module”, “Management Module”, and “Specific Module”. The “Technical Module” and the first part of the “Management Module” are covered in the first semester of the Master's degree programme Analytical Chemistry, the second semester includes the “Specific Module” and the second part of the “Management Module”.

The “Technological Module” is designed to deepen analytical techniques with courses such as “Identification and Structural Characterization”, “Advanced Chromatography”, and “Spectrophotometry and Electroanalysis”. In addition, statistics are applied to chemical analysis in the course “Chemometrics” and the course “Analytical Technology Laboratory” allows the practical application of the content taught in the theoretical courses.

The courses “Management of Projects and Laboratories” and “Quality and Information Management” are part of the “Management Module” which aims at providing the students with knowledge and skills on project and information management in a company.

The “Specific Module” includes the courses “Environmental Quality Analysis”, “Agrofood Analysis”, “Analysis of Pharmaceutical products”, “Analysis of Industrial products” and “Integration and Analytical Specialization Laboratory”. It is aimed at imparting specific theoretical and practical knowledge about the chemical analysis of different substances (e.g. pharmaceuticals, food). All courses encompass five ECTS credits.

The Master’s thesis is conducted in the final semester of the Master's degree programme Analytical Chemistry. It is usually carried out in a research group at IQS, but it is also possi-

ble to prepare the research project in other universities, research institutions, or companies. In all these cases, an institutional agreement is signed. The research project leads to a written report and a presentation in front of an evaluation committee.

In addition to the regular classes during the semester, IQS also offers an internship between the second and third semester. Students with a Bachelor's degree from IQS have carried out a compulsory internship as a part of their studies, but several students in both Master's degree programmes come from other universities and some of them ask for the possibility of doing an internship in a chemical or pharmaceutical company. Initially, IQS offered using the summer time between the end of the second semester and the beginning of the Master's thesis, but the companies did not accept students for such a short time (two months). Since the students chose their topic for the TFM individually, they can decide to begin their research project later and extend the time for the voluntary internship to six months (July – December). The agreement between the student and the company is managed through the IQS Professional Career Service. The employers are very satisfied with the support provided by the Professional Career Service, they appreciate the „easy“ and „on-time“ management of this issue. The student begins the experimental part of the Master's thesis in January and presents the results before the end of the corresponding academic year.

The students mention during the discussion with the peers that some students complete an internship in order to gain more practical experience, to improve their laboratory skills, and to increase their chances at finding an adequate job after graduation. The students express their satisfaction with the programme and the peers judge this to be a useful supplement to the curriculum.

The peers discuss about the organisation of the laboratories and how the practical courses are connected with the lectures. A distinctive feature of both Master's degree programmes are the integrated laboratory courses in the first and second semester. While the theoretical lectures usually are taught in the mornings, there are three hours of practical work in the laboratories every afternoon. The implication on work load and awarded ECTS credits is discussed in more detail under criterion 2.2. The integrated laboratories are designed to combine the different aspects of analytical and pharmaceutical chemistry and require students to build, run and analyse small, laboratory scale systems. The laboratory experiments include learning opportunities in experiment design and preparation, measurement, recording, and analysis from the chemical disciplines that are treated from a theoretical point of view during the lectures. The auditors see that this concept allows for conducting complex experiments while connecting the different theoretical subjects with hands-on experience. The students stress during the discussion with the peers that the extensive practical work in the laboratories is the most important reason why they chose to study at IQS. There is much more laboratory work at IQS than in other universities with similar programmes. In

addition, there are also smaller classes, better and closer contact with the teachers, and better cooperation with private companies. The peers consider the comprehensive and broad practical education of the Master's students and the focus on independent laboratory work at IQS as strong points of both Master's degree programmes.

The peers gain the impression that the graduates of both Master's degree programmes under review are well prepared for entering the labour market and can find adequate jobs in several different areas such as: food industry, pharmaceutical and chemical companies, research institutes, and federal or state ministries. During the discussion with the peers, IQS's partner from the industry confirm that the graduates have a broad scientific education, are very adaptable, and have manifold competences which allows them to find jobs e.g. as research assistants, quality assurance managers or technical experts. Especially IQS's focus on practical laboratory work is appreciated by the employers.

In summary, the auditors are convinced that the intended qualifications profiles of the Master's degree programmes under review allow the students to take up an occupation that corresponds to their qualification.

Criterion 1.4 Admission requirements

Evidence:

- Self-Assessment Report
- Webpage Ma Pharmaceutical Chemistry <https://www.iqs.edu/en/masters/master-pharmaceutical-chemistry/acceptance-master>
- Webpage Ma Analytical Chemistry <https://www.iqs.edu/en/masters/master-analytical-chemistry/acceptance-master>
- Study regulations (RD 1393-2007 ordenación enseñanzas universitarias oficiales, Real Decreto 1027/2011, de 15 de julio, por el que se establece el Marco Español de Cualificaciones para la Educación Superior)
- Transfer and Recognition of credits Regulation (Procediment pel reconeixement i transferència de credits)

Preliminary assessment and analysis of the peers:

According to the Self-Assessment Report, the admission procedures and policies for new and returning students are defined in the study regulations which are published in Spanish on IQS's webpage and thus accessible for all stakeholders.

Both Master's degree programmes are designed for students with a first degree in chemistry, pharmacy, chemical engineering, biochemistry, biotechnology, or engineering. If the applicant has a Bachelor's degree in chemistry he does not have to take any additional courses. If he has another degree, he must enrol for additional courses (bridging courses). The Master's Advisory Committee, which is formed by the programme coordinator, the Dean of IQS School of Engineering, and the General Secretary of IQS, decides on an individual basis, if a student must take additional courses. Typical bridging courses are: "Organic Chemistry II", "Structural Determination", and "Instrumental Analysis". They must be completed before the start of the second semester of the Master's programme.

All applications are analysed by the Advisory Committee which will assess the student's academic record, previous training in relevant disciplines of the Master's programmes, the knowledge of English, and specific training courses. If the number of students exceeds the available places, the Advisory Committee will decide about the admission based on the weighting of the above mentioned criteria: academic record (30%), previous training (30%), knowledge of English (30 %), and specific training courses (10%).

In the Transfer and Recognition of Credits Regulation the procedure for recognising academic competences acquired at other (also foreign) institutions of higher education is described. Students have to submit proper documentation of the competences obtained elsewhere; an academic board analyses the documents and decides if the competences can be recognised as equivalent to certain courses. Usually students sign a learning agreement before going abroad. The auditors judge the process to be in line with the Lisbon convention on the recognition of qualifications.

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:

IQS does not comment on this criterion in its statement.

The peers consider criterion 1 to be fulfilled.

2. The degree programme: structures, methods and implementation

Criterion 2.1 Structure and modules
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Evidence:

- Self-Assessment Report
- Study plans
- Module descriptions

Preliminary assessment and analysis of the peers:

After analysing the module descriptions and the study plans, the peers see that in both Master's degree programmes the individual courses correspond with the definition of "module" in the sense that each course is a sum of coherent learning and teaching units.

The auditors discuss with the programme coordinators the question, why there are no electives in the curriculum of the Master's degree programme Analytical Chemistry. This has the consequence that the curriculum is identical for each student and only the choice of the topic of the Master's thesis opens up a certain flexibility. The programme coordinators explain that while developing the initial curriculum it was not considered necessary to offer elective courses because the programme was designed to focus only on analytical aspects of chemistry. The auditors believe that it is necessary for the students to have the opportunity to set individual scientific emphases in their studies and thus to deepen their personal interests. The students also express their wish for elective subjects during the audit. Since the requirements of the Euromaster® label include that the students must be able to set an individual focus in the course of study, the peer group expects that IQS will define modules as being compulsory and elective (where a student is required to select one or more modules from a limited range). It would not be necessary to develop new courses, but it would be possible to make use of already existing courses from other Master's programmes.

In the Master's degree programme Pharmaceutical Chemistry, currently five courses are taught entirely in English but in most courses the materials and textbooks are in English. The Master's degree programme Analytical Chemistry is taught in Spanish and in English. In five courses there are English elements, such as reports and presentations. In addition, the Master's thesis can be written in English. It is planned to offer all courses in English within the next two years.

International Mobility

The peers notice that there is no window for academic mobility in both Master's degree programmes during the first two semesters. The students can prepare their Master's thesis at a foreign university or research institute. Many students seize this opportunity. According to the Self-Assessment Report, the number of students carrying out the TFM abroad

has been increasing continuously within the last years. The auditors discuss with the programme coordinators and the teachers, how IQS is promoting academic mobility. The professors have several personal contacts to international universities that are based on their research activities. These scientific cooperations are utilised for sending Master's students abroad for conducting the Master's thesis. In addition, IQS has several Erasmus+ cooperations, but they are so far restricted to the Bachelor's programmes. Since fostering internationalisation is one of IQS's strategic goals, it is planned to establish double or joint degree programmes for Master's students in the near future. Moreover, the School of Engineering has recently signed cooperation agreements with Cardiff University and FU Berlin in the area of Pharmaceutical Chemistry which gives students from IQS the opportunity for preparing their Master's thesis in Cardiff or Berlin and vice versa.

Other forms of academic mobility have not occurred so far. As the programme coordinators point out, this is due to the fact that several students come from other universities to study at IQS and, therefore, they want to stay at IQS-SE during the first and second semester. In addition, it is difficult to arrange international exchange programmes, because the curricula of both Master's degree programmes are very specialized and there are only a few foreign universities that offer corresponding programmes. Nevertheless, IQS has realised that gaining international experiences is important for the graduates and enhances their job opportunities. There are a lot of international students in the School of Management but the School of Engineering is mainly focused on research activities and is now trying to catch up in terms of internationalisations. For this reason, IQS wants to offer more courses in English and to establish international cooperations. Also by applying for an international accreditation and the Euromaster® label, IQS wants to foster internationalisation and increase its international visibility. Finally, IQS has applied for entering the Paul Ehrlich Med Chem Euro PhD Network.

The peers support these efforts for fostering internationalisation and increasing academic mobility and encourage IQS to establish more international cooperations.

Criterion 2.2 Work load and credits
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Evidence:

- Self-Assessment Report
- Study plans
- Module descriptions
- Statistical data

Preliminary assessment and analysis of the peers:

The auditors see that IQS applies the European Credit Transfer and Accumulation System (ECTS). According to IQS's regulations, 27 hours of student workload (including lecture hours and self-study hours) are equivalent to one ECTS credit. The auditors confirm that the workload in hours is indicated in the module descriptions and the distinction between classroom work and self-studies is made transparent.

While analysing the module descriptions and the study plans, the auditors notice that only five ECTS credits are awarded for laboratory courses. Hence, they discuss about the actual workload of the laboratory courses with the teachers and the students. They find out that the students work three hours a day in the laboratory, which results in a workload of 15 hours per week. Since the semester encompasses 15 weeks this leads to a total workload of 225 hours per laboratory course. This equals about 8.3 ECTS credits and is obviously not consistent with the awarded 5 ECTS credits. Consequently, the auditors expect IQS to recalculate the awarded credits and to make sure that they are consistent with the students' actual workload. They also stress that they do not recommend reducing the laboratory hours, because the focus on practical and independent work is the most significant strong point of both Master's degree programmes. IQS should keep this focus but make transparent in the study plans and the module description how much time the students really spent in the laboratories. This would probably further strengthen the good reputation of the programmes and attract more students.

The dropout rates in both Master's degree programmes are rather low, almost all students stay in the programmes, only very few students decide to leave IQS.

During the discussion with the peers, the students explain that from their experience the average length of studies amounts to three to four semesters, mostly depending on the design and scope of the Master's thesis. The students stress, that it is possible to finish both Master's degree programmes in the expected time, but research oriented Master's theses often taken longer than the intended six months. This is the personal decision of the individual student and not an inherent structural problem of the degree programmes.

The programme coordinators support this point of view and add that the average length of time for completing the Master's degree programme Pharmaceutical Chemistry is 2.1 years and for completing the Master's degree programme Analytical Chemistry 2.5 years. Since there is only a small number of students that have already finished the degree programmes and some of them have taken more time for completing the Master's thesis, the average length of studies exceeds the regular study time. In addition, the average length of studies is officially calculated in years and not in semesters.

Based on the study plans, the statistical data, and the comments of the students, the auditors conclude that there is no structural pressure on the quality of teaching and the level of education due to the workload. The students express their general satisfaction with the amount and the distribution of their workload.

Criterion 2.3 Teaching methodology

Evidence:

- Self-Assessment Report
- Study plans
- Module descriptions

Preliminary assessment and analysis of the peers:

The Master's degree programmes under review make use of several different educational methods for each course such as: practical laboratory work with presentations and group work, lectures, seminars, and final research project.

Although there are no e-learning or blended-learning elements in use, there is a digital learning platform (Moodle) that is used by teachers and students for presenting documents and interacting with each other. Group projects with oral presentations are conducted in several courses and the Master's thesis is intended to familiarise students with independent academic research activities. The integrated laboratory courses allow for adequate and state-of-the-art experimental work. Generally, the students are satisfied with the existing teaching methods.

In summary, the auditors judge the applied teaching methods and the underlying didactic concept as appropriate and useful to support the students in achieving the intended learning outcomes.

Criterion 2.4 Support and assistance

Evidence:

- Self-Assessment Report

Preliminary assessment and analysis of the peers:

At IQS-SE, the programme coordinators also act as academic advisors for the Master's students. This is only possible because of the small amount of students so far. If more students enrol in the degree programmes it may be necessary to also involve other professors in

directly advising students. The role of the advisor is to help the students with the process of orientation during the first semester, to offer academic advice, make suggestions regarding relevant careers and choice of the Master's thesis. The students confirm during the discussion with the peers that they meet regularly with their advisor and that they can always contact them and ask for advice.

The peers learn that the members of the teaching staff are available on any issues regarding the degree programmes and offer academic advice. They appreciate this "open door policy" and also notice the good and trustful relationship between students and teaching staff. There are enough resources available to provide individual assistance, advice and support for all students. The support system helps 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 lack of scholarships or tuition waivers for Master's students. Since IQS wants to attract more students, also from outside Spain, it would be useful from the auditors' point of view to offer scholarships. This would help to promote the degree programmes and motivate excellent students to apply for studying at IQS-SE.

The auditors especially appreciate the dedication and motivation of the teaching staff and their commitment to the students. They are always accessible by the students and open to suggestions. The auditors are very impressed by the excellent and open minded atmosphere among the students and the staff members, this atmosphere of understanding and support is one of the strong points of the degree programmes.

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

The peers acknowledge that IQS will add elective courses to Master's degree programme Analytical Chemistry (MQA) by changing 6 ECTS credits from compulsory courses to elective courses. This modification will be combined with the change from 5 to 8 ECTS credits awarded for the laboratory courses. The electives will be introduced in 2019/20 and the change in the laboratory courses will be implemented in 2018/19. Together with its statement, IQS provides the new curriculum for MQA and a description of the new structure of the laboratory courses.

The peers see that IQS will follow their suggestions and will introduce electives so that the students can follow their individual interests. In addition, awarded credits and actual workload of the laboratory courses are brought into line. For this reason, the peers abstain from issuing requirements to this respect.

The peers that IQS for clarifying that it is planned to offer all courses in English within the next two years MQF) and in the case of the Master's degree programme Analytical Chemistry (MQA), a longer plan of implementation will be developed.

Finally, the peers appreciate that internationalization is one of the main objectives of IQS's Strategic Plan and that an increase of the scholarships has already been implemented for academic course 2017/18. A specific form and pdf file with information for academic course 2018-2019 has been included in the web page.

Taking into account the already initiated measures and changes, the peers consider criterion 2 to be fulfilled.

3. Exams: System, concept and organisation

Criterion 3 Exams: System, concept and organisation

Evidence:

- Self-Assessment Report
- Module descriptions
- Study plans
- Exam schedules
- Regulation of Exams

Preliminary assessment and analysis of the peers:

According to the Self-Assessment Report, the students' academic performance is evaluated on the basis of their participation in class, their laboratory works and reports, presentations, mid-term exams and tests, and the final exam at the end of each semester. The contribution of each form of assessment to the final grade is mentioned in the detailed module descriptions that are available to the students. Usually, participation contributes 5 %, mid-term exams and tests 25 %, projects and presentations 20 %, and the final exam 50 % to the final mark of the theoretical course. The laboratory courses are graded through experimental work (50 %) and presentations/exercises (50 %). If a student fails a final exam he has a total of four opportunities to pass the exam. There is period of two weeks and the end of each semester during which the final exams are written. Each final exam is offered in every exam period. If a student fails a mid-term exam or one of the ongoing tests, he can redo the test during the semester. The further details are determined in IQS's Regulation of Exams.

The peers discuss with the students how many and what kind of exams they have to take each semester. They learn that for each course there is one final written exam and the end of every semester and additionally there are mid-term exams and tests as well as oral presentations and practical exercises in the laboratories. Although there are a lot of different assessments, the students judge the amount of exams to be acceptable and the examination load to be adequate. The students confirm that they are well informed about the examination schedule, the examination form and the rules for grading.

The peers discuss with the teachers, the students, and the programme coordinators about the concept of grading participation. The teachers explain that the intention is to motivate the students to take actively part at 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, especially in Master's degree programmes, they see that this concept is well established at IQS and widely accepted by students and teachers. The auditors have some concerns about the practicability of grading participation and the possibility of defining objective criteria for grading. The teachers emphasise that participation can be evaluated and graded objectively especially if the courses are rather small. Moreover, they point out that they make the criteria for grading participation transparent to the students at the beginning of each course and that there have been no complaints so far. The students support this point of view and stress that they feel well informed about the criteria and agree with this assessment method. Since the auditors see that the students as well as the teachers accept grading participation as a useful instrument for assessing social competencies and involving the students in the lectures they do not see an acute need for changing the assessment concept.

The Master's thesis implies conducting an individual research project in an IQS research group or abroad. The thesis can also be performed in cooperation with one of IQS's partners from industry. At the beginning of the second semester all teachers provide possible topics for Master's theses, the resulting list is made known to the students who then can choose a suitable topic and contact the responsible professor. The offered topics are aligned with the professors' research lines.

The TFM will lead results in a written report which is presented for defence in front of the evaluation panel. The student has a maximum of thirty minutes to present his findings and conclusions. The panel members then will ask questions and discuss the results with the student. The final grade of the TFM consists of three parts: experimental work is assessed by the supervisor (50 %), the written report (30 %) and the presentation (20%) are assessed by the evaluation panel.

The peers also inspect a sample of examination papers and final theses and are overall satisfied with the general quality of the samples. They confirm the high standard of the Master's theses.

The peers come to the conclusion that the criteria regarding the examinations system, concept, and organization of exams are fulfilled and 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 support IQS's plans to develop guidelines to facilitate teachers' evaluation of participation, it is one of the goals of the "Teaching Innovation" group of the University to design this document.

The peers consider criterion 3 to be fulfilled.

4. Resources

Criterion 4.1 Staff

Evidence:

- Self-Assessment Report
- Staff handbook

Preliminary assessment and analysis of the peers:

The provided staff handbook includes detailed descriptions of the qualification profile of the members of the teaching staff; the peers confirm that the composition, scientific orientation and qualification of the teaching staff are suitable for successfully implementing and sustaining the degree programmes.

The teaching staff of each Master's degree programme under review consists of 12 professors, most of them hold a PhD degree and are accredited by the Agència per a la Qualitat del Sistema Universitari de Catalunya (AQU, Agency for Quality of the University System of Catalonia) or by the Agencia Nacional de Evaluación de la Calidad y Acreditación (ANECA, National Agency for Quality Assessment and Accreditation of Spain). The number of faculty members is appropriate and leads, also due to the small amount of students, to a comparatively good ratio between students and teachers. From the auditors' point of view, there

are enough qualified academic staff members to ensure the adequate implementation of both Master's degree programmes.

The faculty is mainly formed by Chemists and Chemical Engineers with expertise in research and teaching in the specific scientific areas of the respective degree programme. Moreover, in the Master's degree programme Pharmaceutical Chemistry some staff members hold a degree in Pharmacy. The teachers are professionally qualified and their qualification profiles fit well with the scientific focus of the degree programmes. The research and development activities correspond with the goals of the degree programmes and are well integrated into the curricula.

During the discussion with the auditors the teachers confirm that time available for conducting research is balanced with time spend on lectures, tutoring students, and administrative tasks. In summary, they judge their teaching load as adequate and there is enough time for conducting research activities.

Criterion 4.2 Staff development

Evidence:

- Self-Assessment Report
- Staff handbook

Preliminary assessment and analysis of the peers:

IQS offers sufficient opportunities for further education and training in terms of personnel development and qualification of the teaching staff.

The Dean's office and the programme coordinators develop a programme of internal training incorporating the identified needs of the teaching staff. For example, courses on academic innovation, internationalisation, professional and research development have been conducted in the recent years. During the regular Department meetings the needs of the teachers are discussed and specific training courses are subsequently organised.

In addition, English classes for teachers are offered during the summer months, they are positively rated by the teachers who consider the language courses to be very useful to them.

The auditors discuss with the faculty members about the existing opportunities for spending time abroad and for participating in international projects and conferences. They learn that the teachers can go during the summer months for two or three months abroad for research collaborations or for attending workshops and that there are enough funds available for such activities. After seven years of teaching one sabbatical year is possible, but it

must be approved by IQS's management. None of the professors attending the meeting with the peers has yet done a sabbatical.

The only weak point the auditors identify is the fact that the teachers ask for more help in establishing new tools for teaching (e.g. Moodle-platform) and new methods of teaching. For this reason, the peers suggest talking to the members of the teaching staff in order to identify in which areas additional support is needed and then organise appropriate courses.

In summary, the auditors confirm that IQS offers sufficient support mechanisms and opportunities for members of the teaching staff who wish to further develop their professional and teaching skills.

Criterion 4.3 Funds and equipment

Evidence:

- Self-Assessment Report
- On-site visit of the laboratories, the library, and lecture rooms

Preliminary assessment and analysis of the peers:

During the audit, the peer group also visits the laboratories, the library, and the lecture rooms in order to assess the quality of infrastructure and technical equipment. The financial resources of the university are sufficient for guaranteeing the sustenance of the degree programmes. Overall, there are no problems at IQS-SE with respect to resources. On the contrary, the auditors highlight the sophisticated and comprehensive technical equipment of the laboratories which is not common standard at many other universities with similar degree programmes. There are enough advanced instruments for adequately teaching the students, enough working places are available, and the students also have access to the advanced devices and analysis techniques (e.g. nuclear magnetic resonance, gas chromatography and high-performance liquid chromatography including hyphenation to mass spectrometers, capillary electrophoresis, atom emission spectrometry, optical emission spectrometry, mass spectrometry) in the research laboratories. The most remarkable point is that all students are in direct contact with this equipment and learn how to work with it, e.g. by analyzing their samples. This very positive impression is confirmed by the students, they are satisfied with the technical equipment and the resources for teaching.

In the course of the discussion with the auditors, some students criticise a lack of studying places. The auditors cannot confirm that there is a deficit. While visiting the laboratories, the library, and the lecture rooms they notice a lot of available working and studying places.

For example, the cafeteria can be used for studying outside lunch times and also the seminar rooms are available to the students if there are no lectures. In addition, the library offers a lot of opportunities for the students for studying and preparing for their classes.

Finally, the students express their satisfaction with the library opening hours, the available literature, and the accessibility of scientific papers and publications. The library subscribes databases specialized in chemistry, engineering, and research, like: Scifinder Scholar, ISI web of knowledge and electronic journals from Elsevier (Chemistry), Royal Society of Chemistry, American Chemical Society, and IEL (IEEE Xplore Digital Library) Additionally, students at IQS have access to the libraries of other components of Universidad Ramon Llull. Students have access to these databases also from outside via VPN-connection.

The auditors confirm this positive impression, from their point of view there is sufficient access to current international literature and databases and also a remote access is possible.

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

The peers appreciate that IQS will offer more help in establishing new tools for teaching (e.g. Moodle platform) and new methods of teaching. Internal training courses will be offered to all IQS staff members.

The peers consider criterion 4 to be fulfilled.

5. Transparency and documentation

Criterion 5.1 Module descriptions
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Evidence:

- Self-Assessment Report
- Module descriptions

Preliminary assessment and analysis of the peers:

IQS provided detailed and comprehensive module descriptions that include all necessary information about teaching methods, work load, awarded credit points, intended learning outcomes, content, admission and examination requirements, forms of assessment, details explaining how the final mark is calculated, and biographical references.

The module descriptions are accessible to all students and members of the teaching staff.

The only critical aspect the peers notice is the obvious discrepancy between the mentioned workload and the awarded credit in the laboratory courses. This is discussed in more detail under criterion 2.2.

Criterion 5.2 Diploma and Diploma Supplement

Evidence:

- Self-Assessment Report
- Sample Transcript of Records for each degree programme
- Sample Diploma for each degree programme

Preliminary assessment and analysis of the peers:

The peer group notices that a Diploma Supplement is issued after graduation. It includes all necessary information about the structure and content of the respective degree programme. It also informs about the qualification gained, including the achieved learning outcomes and the level and status of the studies that were pursued and successfully completed.

Criterion 5.3 Relevant rules

Evidence:

- Self-Assessment Report
- Webpage Ma Pharmaceutical Chemistry <https://www.iqs.edu/en/masters/master-pharmaceutical-chemistry>
- Webpage Ma Analytical Chemistry <https://www.iqs.edu/en/masters/master-analytical-chemistry>

Preliminary assessment and analysis of the peers:

The auditors confirm that the rights and duties of both IQS and the students are clearly defined and binding. All rules and regulations are published in Spanish on the university's webpage and hence available to all relevant stakeholders.

The auditors point out that on IQS's homepage only basic information about the degree programmes is available in English. Since IQS also wants to attract international students and is planning to offer both Master's degree programmes completely in English within the next two years, it seems useful to provide detailed information about the degree programmes (e.g. study and exam regulations) in an English translation on the webpage.

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

The peers see that IQS puts a lot of effort in updating and improving its website. Currently, and in accordance with IQS internationalisation strategy, these improvements focus on making the information available in English.

The peers consider criterion 5 to be mostly fulfilled.

6. Quality management: quality assessment and development

Evidence:

- Self-Assessment Report
- IQS Quality Assurance System Manual
- IQS Improvement Plan

Preliminary assessment and analysis of the peers:

The auditors discuss the quality management system at IQS with the programme coordinators. They learn that there is a continuous process in order to improve the quality of the degree programmes and it is carried out through internal and external evaluation. Internal evaluation of the quality of the degree programmes is provided through several surveys. First of all there are the course evaluations that are carried out every year after the exam period for each course. They are organised centrally by the university with the purpose of evaluating the performance of teachers. The return rate is rather high usually between 40 % and 50 %. The questionnaire includes 20 questions related to planning, development, results and innovation, and one open question. As the peers find out during the discussion with the teaching staff and the students, the results of the course evaluations are usually not discussed with the students. The programme coordinators confirm that there is no institutionalised feedback to the students about the course evaluations, because they take place after the course has finished. Since the courses are rather small, there is a direct contact between teachers and students and the possibility to personally discuss about deficits in the course. The auditors gain the impression that the students' feedback is taken seriously by the teaching staff and the programme coordinators and changes are made if there is negative feedback. But they think, it would also be useful to inform the students about the results of the survey. For this reason, they recommend closing the feedback loops for example by informing the students via email about the critique and the planned changes.

Secondly, IQS also conducts a graduate survey with respect to the overall quality of the degree programmes in order to determine areas of possible improvement.

In addition, IQS's General Secretary collects data about enrolment, and academic results. These indicators are publicly accessible for each of the degree programmes in the Quality and Accreditation section of the webpage of the degree programme.

With the start of the degree programmes IQS has developed an improvement plan in order to identify weaknesses in the programmes and to implement procedures for solving them. It is a continuous process that results in a biennial action plan with defined responsibilities and deadlines. As both degree programs were only established in 2014, the peers do not expect that many essential changes have been implemented so far because it takes time to evaluate the degree programmes thoroughly. For example, one of the identified weaknesses is the lack of electives in the Master's degree programme Analytical Chemistry, but so far no solution has been applied.

External quality assessment of the degree programmes is provided by AQU.

During the discussion with the representatives of IQS's partners from private companies, the peers learn that there is only an informal involvement of the employers in process of further developing the degree programmes. Teachers use their personal contacts with private companies to discuss with them about the graduates' job opportunities and the requirements of the labour market. As the peers consider the input of the employers to be very important for the further improvement of the degree programmes and IQS has very good contacts to private companies, they suggest developing a culture of quality in which all stakeholders are involved in the quality assurance process. Therefore, they recommend establishing an advisory board with representatives from private companies, specifically for the School of Engineering. This board would also help to stay in contact with the graduates that are now employed in the industry.

In summary, the peer group confirms that the quality management system is suitable to identify weaknesses and to improve the degree programmes. The students are involved in the process but not all feedback loops are closed.

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

The peers acknowledge that IQS follows their suggestion and will inform the students about the results of the course evaluations and the proposed changes.

IQS will improve the communication with the students to this respect by emphasising this information in the Academic Board, where the students have their own representatives. In

addition, this topic will be included within the content of the welcome session for students, which is done by the programme coordinators at the beginning of the academic year.

The peers consider criterion to be fulfilled.

D Additional Documents

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

- none

E Comment of the Higher Education Institution (05.07.2018)

The institution provides a detailed statement.

F Summary: Peer recommendations (20.07.2018)

Taking into account the additional information and the comments given by IQS, 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
Ma Pharmaceutical Chemistry	Without requirements	Euromaster®	30.09.2024
Ma Analytical Chemistry	Without requirements	Euromaster®	30.09.2024

Recommendations

For all degree programmes

- E 1. (ASIIN 5) It is recommended to provide detailed information about the degree programmes on the webpage.
- E 2. (ASIIN 5.1) It is recommended to involve the stakeholders in further developing the degree programmes on an institutional level.

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 and agrees with the proposed recommendations.

Assessment and analysis for the award of the Euromaster® label:

The Technical Committee is of the opinion that the desired learning outcomes fully correspond to the fields of knowledge defined by ECTN. Therefore, they suggest awarding the Euromaster® label for both degree programmes.

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

Degree Programme	ASIIN seal	Subject-specific labels	Maximum duration of accreditation
Ma Pharmaceutical Chemistry	Without requirements	Euromaster®	30.09.2024
Ma Analytical Chemistry	Without requirements	Euromaster®	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 and agrees with the proposed recommendations.

Assessment and analysis for the award of the Euromaster® label:

The Accreditation Commission agrees with the proposed recommendations

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

Degree Programme	ASIIN seal	Subject-specific labels	Maximum duration of accreditation
Ma Pharmaceutical Chemistry	Without requirements	Euromaster®	30.09.2024
Ma Analytical Chemistry	Without requirements	Euromaster®	30.09.2024

Recommendations

For all degree programmes

- E 1. (ASIIN 5) It is recommended to provide detailed information about the degree programmes on the webpage.
- E 2. (ASIIN 5.1) It is recommended to involve the stakeholders in further developing the degree programmes on an institutional level.

Assessment 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 Master's degree programme Pharmaceutical Chemistry:

MQF Students will be able to:

Basic competences

CB6 - Have and understand knowledge which provides the ground or opportunity to be innovative in the development and/or application of ideas, often in a research context

CB7 - Apply their knowledge and their ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study

CB8 - Integrate knowledge and deal with the complexity of formulating judgments based on information which, being incomplete or limited, includes reflections on social and ethical responsibilities related to the application of their knowledge and judgments

CB9 - Communicate conclusions, and the reasons that sustain them, to specialized and non-specialized audiences in a clear and unambiguous way.

CB10 - Understand the need for life-long learning in a self-directed or autonomous way.

MQF-General competences

CG1 - Ability to lead, direct and manage projects in academic or business environments adapting to the structures, needs and ways of operation of each institution

CG2 - Ability to perform a responsible practice of the profession

MQF-Specific competences

E1 - Demonstrate knowledge of the phases of the R&D of a drug, the main therapeutic groups and the pharmaceutical, pharmacokinetics phases and pharmacodynamics of a drug and apply in pharmaceutical chemistry

E2 - Ability to associate the structure of drugs with their molecular mechanism of action, therapeutic activity and metabolism

E3 - Demonstrate knowledge about patents in the pharmaceutical sector, its implications and application in drug development

E4 - Demonstrate knowledge of project management and tools for planning, implementation and monitoring of projects for application in pharmaceutical chemistry

E5 - Ability to define tasks, assign resources, define costs and track a project

E6 - Demonstrate knowledge of the techniques of computer-aided molecular design for application in drug research

E7 - Ability to raise, discern and apply advanced computer simulation techniques and use them to design compounds with biological activity

E8 - Demonstrate knowledge of retrosynthetic analysis and new reactions and synthetic methodologies for application in drug research

E9 - Ability to develop synthetic routes for multifunctional organic molecules by applying the "back step" method

E10 - Demonstrate advanced knowledge of NMR, X-ray diffraction and thermal analysis for application in drug research

E11 - Ability to interpret the results obtained with NMR, X-ray diffraction and thermal analysis to identify and determine the structure of chemical compounds

E12 - Ability to apply different computational, synthetic and spectroscopic techniques related to drug research

E13 - Demonstrate knowledge of the development of synthetic processes on an industrial scale to be applied in the production of drugs

E14 - Ability to select synthetic routes amenable to industrialization taking into account economic, environmental and safety aspects

E15 - Demonstrate advanced knowledge of analytical methods for raw materials, formulated products, active substances, excipients, impurities and degradation products enantiomers present in samples in the pharmaceutical field for application in the production of drugs

E16 - Ability to interpret the analytical results obtained on samples of the pharmaceutical sector (raw materials, formulated products, active substances, excipients) and the determination of impurities and degradation products enantiomers in that type of samples

E17 - Demonstrate knowledge of the concepts and tools for quality management in laboratories and industry for application in the production of drugs

E18 - Ability to lead, direct and manage projects in chemistry contemplating the requirements of a quality system

E19 - Ability to apply different synthetic, spectroscopic and analytical related to drug production techniques taking into account the implications of GLP / GMP environment and the ICH standards and pharmacopoeia in drug analysis

E20 - Demonstrate complementary skills useful for the practice of pharmaceutical chemistry

E21 - Ability to recognize or related in some way with the practice of pharmaceutical chemistry that will be useful for the development of professional practice related disciplines

E22 - Ability to plan, implement, manage and present a research project in the field of Pharmaceutical Chemistry

E23 - Ability to develop activities of fundamental and applied research and innovation in academic and industrial environments by integrating projects and interdisciplinary activities

E24 - Ability to apply and integrate advanced knowledge of the disciplines of Pharmaceutical Chemistry in the realization of a project of fundamental research or applied

E25 - Ability to apply advanced chemical methodologies and tools for research, development and production of products and services in the field of Pharmaceutical Chemistry

E26 - Ability to design, perform and interpret experiments in the field of Pharmaceutical Chemistry

E27 - Ability to obtain original results susceptible of being published and/or patented

MQF-Transversal competences

T1 - Ability to communicate in English and use English as a working language

T2 - Ability to lead and direct teams

T3 - Ability to assess the impact of the use of chemistry in sustainable development of society

The following curriculum is presented:

Master's degree in Pharmaceutical Chemistry (MQF) Course 2017-2018				
MQF Module	Subject	ECTS	Faculty	Language
Transversal Module	Pharmaceutical Chemistry	5	Dr. José I. Borrell	English
	Project Management	5	Dr. Judith Bàguena	Spanish
Drug Research Module	Molecular Design	5	Dr. Jordi Teixidó Dr. Roger Estrada	Spanish, materials in English
	Advanced Organic Synthesis	5	Dr. David Sánchez-García	English
	Identification and Structural Characterization	5	Dr. Xavier Batllori	Spanish, materials in English
	Integrated Laboratory I	5	Dr. Ana Belén Cuenca	English and Spanish
Drug Production Module	Process Chemistry	5	Dr. José I. Borrell	English
	Drug Analysis	5	Dr. Frances Broto	Spanish, materials in English
	Quality Management and Regulatory Affairs in the Pharmaceutical Industry	5	Dr. Ana Cuartero	Spanish, materials in English
	Integrated Laboratory II	5	Dr. David Sánchez-García	English and Spanish
Electives	Photochemistry	5	Dr. Santiago Nonell	English
	Pharmacology for Chemists	5	Dr. Ana Belén Cuenca	Spanish, materials in English
	Experimental Design	5	Dr. Laura Fernández-Ruano	Spanish
	Advanced Drug Delivery	5	Dr. Victor Ramos	English
TFM	Master Thesis	30	----	English and Spanish

Table C1-1. MQF structure				
Module	ECTS	Semester		
		1	2nd	3rd
M1 Transversal Module	10			
M2 Drug Research Module	20			
M3 Drug Production Module	20			
M4 Module of Elective Matters	10			
M5 Master Thesis	30			
Total	90	30	30	30

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

MQA students will acquire the following competences:

Basic competences

CB6 - Have and understand knowledge which provides the ground or opportunity to be innovative in the development and/or application of ideas, often in a research context

CB7 - Apply their knowledge and their ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study

CB8 - Integrate knowledge and deal with the complexity of formulating judgments based on information which, being incomplete or limited, includes reflections on social and ethical responsibilities related to the application of their knowledge and judgments

CB9 - Communicate conclusions, and the reasons that sustain them, to specialized and non-specialized audiences in a clear and unambiguous way.

CB10 - Understand the need for life-long learning in a self-directed or autonomous way.

General competences

CG1 - Ability to lead, direct and manage projects in academic or business environments adapting to the structures, needs and ways of operation of each institution

CG2 - Ability to perform a responsible practice of the profession

Specific competences

E1 - Demonstrate advanced knowledge of NMR, X-ray diffraction and thermal analysis for designing, applying and interpreting analytical methods.

E2 - Ability to interpret the results obtained with NMR, X-ray diffraction and thermal analysis to identify and determine the structure of chemical compounds

E3- Demonstrate advanced knowledge of gas chromatography, liquid chromatography, mass spectrometry and electrophoretic techniques for designing, applying and interpreting analytical methods.

E4 - Ability to interpret the results obtained with chromatographic, electrophoretic techniques and mass spectrometry in the identification and quantitative determination of chemical compounds

E5- Demonstrate advanced knowledge of atomic and molecular spectroscopies, voltamperometry, voltammetry and other advanced electrochemical techniques for designing, applying and interpreting analytical methods.

E6 - Ability to interpret the results obtained with advanced techniques of atomic and molecular spectroscopies, voltamperometry, voltammetry and other advanced electrochemical techniques in the quantitative determination of chemical compounds detected in samples.

E7- Demonstrate advanced knowledge of statistical techniques, design of experiments and process optimization for designing and developing analytical methods.

E8 - Ability to interpret the results obtained applying statistical techniques, design of experiments and process optimization methods to experimental data obtained in an analytical chemistry laboratory

E9 - Demonstrate knowledge of project management and tools for planning, implementing and monitoring projects

E10 - Ability to define tasks, assign resources, define costs and monitoring a project

E11 - Demonstrate knowledge of Quality Management concepts and tools for its application to analysis laboratories and industry in general

E12 - Ability to lead, direct and manage projects in chemistry according to the requirements of a quality system

E13- Demonstrate advanced knowledge of analytical methods for determining the composition of environmental samples (air, water, soil, sediments, waste, ...), for identifying and quantifying pollutants in these samples, as well as of specific analytical techniques for the environment.

E14 - Ability to interpret the analytical results obtained in environmental samples (air, water, soil, sediments, waste, ...) and of pollutants detected in these samples

E15 - Demonstrate advanced knowledge of analytical methods for the characterization of raw materials, formulated products, active pharmaceutical ingredients and excipients, and the identification and quantification of impurities, enantiomers and degradation products present in pharmaceutical samples

E16 - Ability to interpret the analytical results obtained in pharmaceutical samples (raw materials, formulated products, active pharmaceutical ingredients, excipients) and in the determination of impurities, enantiomers and degradation products in these samples

E17 - Demonstrate advanced knowledge of analytical methods for determining composition and functional properties of food, and for identifying and quantifying impurities, foreign substances and residues in samples of food and agricultural products.

E18 - Ability to interpret the analytical results obtained in food samples (composition and functional properties) as well as and in the identification and quantification of impurities, foreign substances and residues in these samples.

E19 - Demonstrate advanced knowledge of analytical methods for the determination of majority and minority components, impurities and functional properties in raw materials, metals, polymers, ceramics and formulated products as well as of specific analytical techniques for these types of samples.

E20 - Ability to interpret the analytical results obtained in samples of raw materials, metals, polymers, ceramics and formulated products obtained with general analytical techniques or specific for these types of samples.

E21 - Ability to plan, implement, manage and present a research project in the Analytical Chemistry field

E22 - Ability to develop activities of fundamental and applied research and of innovation in academic and industrial environments integrating projects and interdisciplinary activities

E23 - Ability to apply and integrate advanced knowledge of the Analytical Chemistry disciplines in the realization of a project of fundamental or applied research

E24 - Ability to apply advanced chemical methodologies and tools for research, development and production of products and services in the Analytical Chemistry field

E25 - Ability to design, perform and interpret experiments in the Analytical Chemistry field

E26 - Ability to obtain original results susceptible of being published

Transversal competences

T1 - Ability to communicate in English and use English as a working language

T2 - Ability to lead and direct teams

T3 - Ability to assess the impact of the use of chemistry in the sustainable development of the society

The following **curriculum** is presented:

Master's degree in Analytical Chemistry (MQA) Course 2017-2018					
MODULE	SUBJECT	COURSE	ECTS	PROFESSOR	LANGUAGE
M1 TECHNOLOGICAL MODULE	Advanced Analytical Chemistry	Identification and Structural Characterization	5	Dr. Xavier Batllori	Spanish, materials in English
		Advanced Chromatography	5	Dr. Lluís Comellas, Dra. Gemma Gotor	Spanish
		Spectrophotometry and Electroanalysis	5	Dr. Sergi Colominas, Dra. Ariadna Verdaguer	English, Spanish
	Statistics and Experimentation	Chemometrics	5	Dr. Lucinio Gonzalez	Spanish
		Analytical Technology Laboratory	5	Dra. Victoria Codera	English, Spanish
M2 MANAGEMENT MODULE	Management	Management of projects and laboratories	5	Dra. Judith Báguena	Spanish
		Quality and information management	5	Dra. M José Blanco	Spanish
		Environmental quality analysis	5	Dr. Jordi Díaz	English, Spanish
M3 SPECIFIC MODULE	Environmental, Food and Pharmaceutical Analysis	Agrofood analysis	5	Dra. Gemma Gotor	Spanish
		Analysis of pharmaceutical products	5	Dr. Francesc Broto	Spanish
		Analysis of industrial products	5	Dr. Jordi Abellà	English, Spanish
	Industrial and Experimental Analysis	Integration and analytical specialization laboratory	5	Dr. Sergi Colominas	English
		Master's Thesis	Master's Thesis	30	-----

Table C1-2. MQA structure				
Module	ECTS	Semester		
		1st	2nd	3rd
M1 Technological Module	25			
M2 Management Module	10			
M3 Specific Module	25			
M4 Master's Thesis	30			
Total	90	30	30	30