

Subject Guide

1. Information about the subject

SUBJECT	Bachelor Thesis	CODE	GQUIMI01-4-016
EDUCATIONAL OFFER	Bachelor's Degree in Chemistry	CENTER	Facultad de Química
TYPE	Degree Final Project	N° TOTAL CREDITS	18.0
PERIOD	Annual	LANGUAGE	Spanish English
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2. Context

Royal Decree 1393/2007, of October 29, which regulates the management of official university education, establishes the obligation to carry out an End-of-Degree Work (TFG). The aforementioned regulations state that the TFGs must be carried out in the final phase of the curriculum and be oriented to the evaluation of the acquisition by the student of the competences associated with the Degree.

The University of Oviedo, in the exercise of its autonomy, has established its own rules regarding the TFG, which is contained in the Regulation on the Subject (Trabajo Fin de Grado, End of Degree Work) at the University of Oviedo, approved by the Governing Council (Consejo de Gobierno) held on June 28, 2012 (BOPA nº 165 of July 17, 2012).

In compliance with the current regulations, the Degree in Chemistry includes the subject End of Degree in Chemistry (hereinafter TFGQ), which implies the student's autonomous and individual realization of a project, memory or study, in which it demonstrates in an integrated way that he / she has acquired the competences of the Graduate Degree / Degree in Chemistry.

The TFGQ will deal with topics related to the Degree in Chemistry, which allow to evaluate the learning results and competences of the Degree in Chemistry, and in accordance with the competences and learning outcomes acquired by the student in the training period prior to the completion of the work .

The student will perform the TFGQ under the supervision of a Tutor, whose role will be to guide and advise the student during the work and the preparation of the corresponding report, as well as to prepare the corresponding evaluation report of the work done, prior to its defense.

In the Curriculum of the Degree in Chemistry, the TFGQ is a compulsory subject of the fourth course, of 18 ECTS (450 total hours), which is designed so that it can be developed and realized by the student, and later evaluated, in the temporal duration assigned to the subject.

The degree of presence of the TFGQ is 10% (45 hours face-to-face), distributed in lectures (CEX), Group Tutorials (TG), Laboratory Practices (PL) and Evaluation Sessions (SE).

The teaching of the subject TFGQ is assigned to the Departments of Physical and Analytical Chemistry and Organic and Inorganic Chemistry with headquarters in the Faculty of Chemistry (Agreement of the Faculty Board of 22-06-2012), which must be responsible for the tuition of students enrolled in the TFGQ.

The TFGQ will be grouped into four generic topics: Analytical Chemistry, Physical Chemistry, Inorganic Chemistry and Organic Chemistry. Each generic topic will be made up of specific TFGQ proposals, each of which will be carried out by a single student, except extraordinary circumstances, such as a high number of students enrolled in the subject.

In each generic topic, groups will be formed, each of them, for a maximum of ten students. Each of these groups will be assigned one, or two, instructors-tutors.

The instructor-tutors of each generic topic will be Doctors belonging to the area of knowledge whose name coincides with that of the protected subject matter. These tutors will perform the guardianship tasks of all the students who perform the TFGQ in a certain generic topic. The set of instructor-tutors of the four generic topics compose **the Teaching Team of the subject**.

3. Requirements

The Regulation on the Subject of *End of Degree Work* (TFG) in the University of Oviedo, establishes, in its article 4, the requirements of enrollment on the subject:

1. The registration on the TFG will be carried out in the same terms as the rest of subjects or courses of the curriculum of the Degree.
2. Students can enroll in the TFG when they have a maximum of 72 ECTS left to complete the degree and must be enrolled in all the basic and compulsory credits that are left to finish.

Upon completion of the official enrollment period, the Dean will communicate to each of the Departments involved in the teaching of the subject the number of specific TFGQ that he / she must propose. This number will be equal to the number of students enrolled in the subject in the corresponding academic year multiplied by 0.7 (Agreement of the Faculty Board of 22-09-2016).

Each Department will approve and send to the Administration of the Center the list of specific topics requested, as well as the name of the instructors-tutors of each generic topic.

The Teaching Commission of the Degree in Chemistry, by delegation of the Faculty Board, will evaluate the proposals presented by the Departments and will approve the definitive list of specific TFGQ offered.

On the first academic day of October of the corresponding academic year, the Center will make public the definitive list of topics offered, as well as the relation of Instructors-tutors of generic topics. For those students who have extended their enrollment to the TFGQ in the period established for the purpose, a list will be published during the month of March, in which will appear the topics of the definitive relation that had not been chosen in the month of October.

Within a maximum period of 10 calendar days, counted from the date of publication of the final list of subjects offered, enrolled students must request the assignment, in order of preference, of a number of subjects offered equal to the number of students enrolled in the subject.

The Teaching Commission of the Degree in Chemistry will be in charge of realizing the provisional proposal of student-subject, assuming, as much as possible, the preferences manifested by the students and taking into account that the maximum number of students by generic subject may not May exceed 25% of the total TFGQ offered.

For the assignment of the different specific subjects, the Teaching Commission will order the students according to

the following protocol:

- The student who has passed all the basic, compulsory and optional credits of the first three years of the Degree in Chemistry will have preference.
 - In the event of a tie, the student with higher average grades (in base 10) in the academic record will have preference.
 - If a tie persists, the student who has obtained the highest number of honorary and outstanding registrations (matricula de honor y sobresaliente respectivamente) will be preferred and, if the tie is maintained, the one that has made the least number of extraordinary calls will be proposed.
 - If it is not possible to determine the order of preference with the indicated criteria, the allocation will be made by means of a raffle.

Before the first school day of November, the provisional list of adjudications will be made public, on official boards and on the website of the Faculty. This list will be communicated to students enrolled in the subject by email to their institutional account at the University of Oviedo. The adjudications will be valid for two consecutive academic years, unless the student requests a new award. Therefore, if the student does not pass the course in that course and enrolls in the following course, it will not be necessary to renew this adjudication, unless the student requests to change it.

As of the date of publication of the provisional list of adjudications, a period of claims of five calendar days is established, which will be addressed to the Dean of the Faculty.

The Teaching Commission of the Degree in Chemistry will resolve the claims submitted, within five calendar days, and proceed to the publication of the definitive list of adjudications. Any subsequent modification of the definitive list must be authorized and made public by the Teaching Commission of the Degree in Chemistry, previous common agreement between the students and the instructors affected.

4. Competencies and learning results

In the subject TFGQ the students must demonstrate that they have acquired the competences of the Degree in Chemistry, which enable them to start their professional development in the different fields of influence of Chemistry, both at industrial and research level.

Therefore, the subject TFGQ does not have assigned a specific set of competences within the Degree in Chemistry, but is the means by which it is assessed whether the student has acquired, throughout his formative period in the Faculty, the competences characteristic of each of the subjects of the Curriculum, which together form the competences of the Degree in Chemistry.

According to the Report of the Degree in Chemistry, the basic competences that must be evaluated in the subject TFGQ, are the following:

CB-1: To possess and to understand knowledge in Chemistry to the level established in the Plan of Studies of the Degree in Chemistry. This competence will be evaluated by the instructor-tutor during the accomplishment of the work and elaboration of the corresponding report and by the Evaluating Committee in the act of defense.

CB-2: Apply chemical knowledge to your work or vocation in a professional way and possess the skills that are usually demonstrated through the elaboration and defense of arguments and problem solving within the area of Chemistry. This competence will be evaluated by the instructor-tutor during the accomplishment of the work and elaboration of the corresponding report and by the Evaluating Committee in the act of defense.

CB-3: Gather and interpret relevant data, within the area of Chemistry, to issue judgments that include a reflection on social, scientific or ethical issues. This competence will be evaluated by the instructor-tutor during the accomplishment of the work and elaboration of the corresponding report and by the Evaluating Committee in the act of defense.

CB-4: To transmit information, ideas, problems and solutions of the chemical field to a specialized and non-specialized public. This competence will be evaluated by the instructor-tutor and by the Evaluating Committee in the act of defense.

CB-5: To develop those learning abilities necessary to undertake later studies in Chemistry with a high degree of autonomy. This competence will be evaluated by the instructor-tutor during the accomplishment of the work and

elaboration of the corresponding report.

These competences are translated into the following learning outcomes:

R.1: Consult and use scientific information effectively. (CB-3)

R.2: Recognize and analyze new problems in the field of chemistry and plan strategies to solve them. (CB-2 and CB-5)

R.3: Prepare and present a report correctly both orally and in writing. (CB-4)

R.4: Demonstrate knowledge and understanding of the facts, concepts, principles and theories related to the subjects that make up the Degree of Chemistry and its application to problem solving. (CB-1)

R.5: Relate the fundamentals of analytical, spectroscopic and structural research techniques to their applications. (CB-1)

R.6: Recognize and assess risks in the use of chemicals and laboratory procedures, which involves safe handling of chemicals and standard chemical instrumentation. (CB-1)

R.7: Perform laboratory, analytical and synthetic practices, with scientific rigor in measure, in the operational procedure and in obtaining data. (CB-1 and CB-5)

R.8: To know and use, with safety and respect for the environment, laboratory techniques for the analysis, synthesis and characterization of chemical substances, including the necessary calculations and expressing the results in an appropriate manner. (CB-1)

R.9: Follow up of a chemical reaction by observing and measuring chemical properties, collecting the appropriate information and relating it to the theoretical concepts on which it is based. (CB-1 and CB-5)

R.10: Obtain quality experimental results. (CB-5).

5. Contents

The TFGQ will be grouped into four generic topics: Analytical Chemistry, Physical Chemistry, Inorganic Chemistry and Organic Chemistry. Each generic topic will be made up of specific TFGQ proposals, each of which will be carried out by a single student.

The TFGQ will deal with work related to the Degree in Chemistry, which will allow to evaluate the learning results and competences of the Degree in Chemistry, and in accordance with the competences and learning results acquired by the student in the training period of the Degree in Chemistry previous to the accomplishment of the work.

The TFGQ will be of a theoretical and practical nature and will be carried out in the facilities of the areas responsible for each of the generic topics. They will consist in the accomplishment, by the student, of a theoretical-practical work related to the generic subject to which it is assigned. The student should carry out a bibliographic review of the topic, elaborate a detailed script of the procedure to be followed in carrying out the practical work, which will include the instrumentation to be used, as well as elaborate and defend in front of the corresponding Evaluation Committee a Report of the work done. All actions will be carried out under the tutelage of the corresponding instructor-tutor.

Students must present in the Center's Administration four copies of the TFGQ Memory in electronic format (DVD, CD, ..) and in a protected computer format in order to modify the files, identifying the student's name, title of the work, Generic theme to which it belongs and month and year of defense.

The TFGQ Report, which will have a minimum length of 15 pages and a maximum of 30 (Faculty Board Agreement 07-05-2014), will include at least the following aspects: Introduction and objectives; Experimental part; Discussion of results; Conclusions; Bibliography. As far as the bibliography is concerned, citations referring to information contained in websites should be separated from the rest of the citations (articles in journals, books) and constitute a

distinct group (Faculty Board Agreement 07-05-2014).

In each of the official calls for defense of the TFG, the deadline for the submission of reports in the Administration of the Center will be published together with the convening of the reading and public defense session of the reports.

6. Methodology and working plan

In the Curriculum of the Degree in Chemistry, the TFGQ is a compulsory subject of the fourth course of 18 ECTS distributed asymmetrically between the two semesters, 6 ECTS in the first semester and 12 ECTS in the second. The TFGQ will be designed so that it can be developed and carried out by the student in the 18 ECTS (450 total hours) assigned to the subject.

The degree of presence of the TFGQ is 10%, which means 45 face-to-face hours. Although the face-to-face activities of the TFGQ will consist mainly of Group Tutorials (TG), it will be possible to carry out Exposition Classes (CEX), Laboratory Practices (PL) and Evaluation Sessions (SE).

The expository classes will outline the guidelines to be followed for the preparation of scientific reports and presentations, as well as the resources available for bibliographic searches. In the first session the Teaching Guide of the subject will be presented and emphasis will be placed on the importance for the student to know the content of the same. For the development of the CEX, a single group of students will be organized, unless that their number exceeds that stipulated by the University of Oviedo to form a new group in this type of teaching methodology. The on-call time allocated to the CEX is 5 hours, which will be organized in the week following the publication of the definitive list of adjudications.

The Group Tutorials (TG) will be done with all the students that integrate each one of the groups of a generic theme. In this teaching activity, the instructor-tutor of the group will guide the students in the bibliographic search regarding the subject assigned to each one, as well as exercise the tuition related to the elaboration and accomplishment of the work, and the preparation of the defense of the TFGQ. The presenciality assigned to the TG is 20 hours, distributed in sessions that, for guidance, will have the following approximate temporal sequencing:

- *First TG session.* It will be conducted after the CEX (in the month of November). In this session the instructor-tutor will inform the students about the schedule of the work to be done, will guide them about the resources and specific bibliographic sources of the corresponding generic topic that they will have to consult, attend the questions raised by the students regarding the topic of work, will show them the facilities and infrastructures in which the work will be developed, and will set a date for the next TG session.

- *Second TG session.* It will be held in the last school week of December. The students will inform by means of a brief oral presentation to the tutor and the rest of the students of the group, of the work done, concerning the bibliographic search related to the subject of the work and the analysis of the work that leads to the selection and prioritization of the compiled bibliographic material. In addition, the students will give the instructor-tutor the proposal of a detailed script, in electronic format, of the procedure to follow in the development of the work. It will also deliver, in the same format, the chapter of introduction and objectives corresponding to the final report of the work, in which it must collect the bibliographic background and the analysis done for the elaboration of the script delivered. They will arrange a date for the next TG session.

- *Third TG session.* It will be held in the second week of February. The instructor-tutor will deliver to each student the evaluation report corresponding to this stage and will comment with the students the proposals for improvement of the script and the chapter of introduction and objectives, guiding them in the realization of the same. They will arrange a date for the next TG session.

- *Fourth TG session.* It will be held in the last week of February. The students will deliver the definitive script and make a brief presentation of the same before the instructor-tutor and the rest of students of the group. When required by the development of the TFGQ, the student will give the instructor-tutor a list with the reagents, laboratory material and equipment necessary to carry out the work. These lists will be supervised by the tutor, who will send them to the

Department's Director responsible for the generic topic. The Department's Management will ensure that all necessary reagents, laboratory equipment and scientific equipment are available to the students on the day the practical work begins. They will arrange a date for the next TG session.

- *Fifth TG session.* It will be held in the last week of March. The student will submit to the instructor-tutor in electronic format, a proposal for writing, the work done and that will constitute the chapter of the experimental part of the final report. The student will make a brief oral presentation, in front of the instructor-tutor and the rest of the students in the group, of the proposal made. They will arrange a date for the next TG session.
- *Sixth TG session.* It will be held in the second week of April. The tutor will deliver to each student the evaluation report corresponding to the work done in the lab, and the elaboration of the chapter of the experimental part of the report, and will comment with the students the proposals of improvement of the written chapter, orienting them in the realization of the same. They will arrange a date for the next TG session.
- *Seventh TG Session.* It will be held in the second half of April. The student will submit to the Professor-tutor a written draft, in electronic format, of the chapters: discussion of results, conclusions and bibliography, of the final report of the work. In addition, they will make a brief oral presentation of the content of the report in front of the instructor-tutor and the rest of the students. They will arrange a date for the next TG session.
- *Eighth TG session.* It will be held in the first week of May. The tutor will deliver to each student the evaluation report corresponding to the work done in the elaboration of the chapters corresponding to discussion of results, conclusions and bibliography, and will comment with the students the proposals for improvement of the chapters evaluated, guiding them in their realization. They will arrange a date for the next TG session.
- *Ninth TG session.* It will be held in the second week of May. The students will deliver the final report of the Final Degree Work and give an oral presentation to the -tutor and the rest of the group's colleagues, in the format and time allocated to each presentation in the act of defense in front of the Evaluation Committee. They will arrange a date for the next TG session.
- *Tenth TG Session.* It will be held the first week of June. The instructor-tutor will deliver to each student the evaluation report corresponding to the work done in the preparation of the final report and in the presentation, and will comment with the students the suggestions for improvement of the chapters evaluated, orienting them in their realization.

The experimental part of the work will be done, in the same period of time and individually, by all students of each of the groups of a generic topic under the tutelage of the instructor-tutor. The presenciality assigned to the practical part is of 15 hours, in sessions that will be developed in the second half of the month of March. The duration of the sessions will be agreed between the students and the instructor-tutor.

The Sessions of Evaluation (SE) will be held in front of the Evaluation Committee designated for this purpose for each generic topic. The students of each generic subject must be present during all the defense sessions that take place before the corresponding Committee.

The presenciality assigned to the SE is 5 hours.

	TIME DISTRIBUTION	Hours	%		Totals
	Expositive Classes	5		1,1	
	Laboratorio hours/	15		3,3	

Presencial				45
	Group tutorials	20		4,5
	Evaluation sessions	5		1,1
	Group work			
Non presencial				405
	Individual work	405		90
	Total	450		

7. Evaluation of the student's learning results

The subject TFGQ aims to evaluate the level of acquisition by the student, of the competences proper to the Degree in Chemistry. It is, therefore, an evaluation subject, in which two agents participate: the instructor-tutor and the Evaluation Committee.

In order to guarantee objectivity and homogeneity in the evaluation processes of students in the different groups that integrate the different generic themes, an evaluation protocol has been established for its application by both the instructor-tutor and the Evaluation Committee. These documents are included in the annexes to this Teaching Guide: Annex I. Guide of recommended indicators. Annex II. Matrix of evaluation of the TFGQ by the teacher-tutor. Annex III. Matrix of evaluation and qualification of the TFGQ by the Evaluation Committee. (Faculty Board Agreement 07-05-2014).

In all the transversal competences of the Degree in Chemistry, it seems evident that the CB-1 and CB-4 competences form the nucleus and the more substantial part of the TFGQ, which does not mean that the other competences of the Degree are not equally important, but its weight in the evaluation of the work done should not be the same. The weighting of the different transversal competences is included in the evaluation matrices by the instructor-tutor (Annex II) and by the Evaluating Committee. (Annex III).

The final grade of the subject will be awarded by the Evaluation Committee taking into account the documentation submitted by the student, the presentation and defense of the work, and the report of the instructor-tutor, according to the evaluation criteria included in this Teaching Guide and in the accompanying annexes. Thus, 40% of the final grade will correspond to the instructor's evaluation report, which will not be vinculating, and the remaining 60% to the evaluation report of the Evaluation Committee (Faculty Board Agreement of 07-07-2015).

7.1 Evaluation by the Instructor-Tutor.

The Instructor-Tutor will evaluate the degree of acquisition of the competences of the Degree in Chemistry by the student following the protocol included in Annex II of this guide, drawn from the document included in Annex I.

Once the process of guardianship and evaluation is completed, the Instructor-Tutor of each generic topic will send to the Administration of the Center the evaluation report of each of the works protected in a closed envelope, at least 10 calendar days before the Defense of the same. The evaluation report of each student will be incorporated into the documentation that the Administration of the Center will send to the Evaluation Committee.

7.2 Evaluation by the Evaluation Committee.

A different Tribunal will be constituted for each generic topic (Analytical Chemistry, Physical Chemistry, Inorganic Chemistry and Organic Chemistry). Each of these Tribunals will be formed by three professors of the Teaching Team of the subject, excluding the Instructors-Tutors responsible for the generic topic for which the Committee has been constituted.

In each Committee there will be a President and a Secretary. The criteria of professional category and seniority will be used to appoint the president and the secretary.

The members of a Tribunal can not belong, in its entirety, to the same Area of Knowledge.

It is the responsibility of the Decanal Team of the Faculty to designate the members of each Committee, as well as the organization of its sessions. In order to do this, it will establish the day, time and place of the defenses of the TFGQ, as well as the order of exposition of the works by the students, for each Committee.

Students should prepare a presentation, in electronic format, containing a summary and the most relevant aspects of the work done. This presentation will be presented, orally, by the student before the corresponding Evaluating Court in the defense of the elaborated Report, for a maximum time of fifteen minutes. Students will then answer questions raised by members of the Tribunal for a maximum of 20 minutes. Within each Court, the students will be ordered according to the alphabetical order of their first last name.

The defense of the TFGQ will be done by the students in public and in person. The Teaching Commission of the Degree in Chemistry may authorize distance defense in virtual form, provided the technical, administrative and economic conditions that allow its viability are met.

The dates for the realization of the defenses of the TFGQ, both in the ordinary and extraordinary convocation, are included in the academic calendar of the university for the current course.

In the presentation and defense of the report, the Evaluation Committee will evaluate and numerically qualify the degree of acquisition by the student of the competences of the Degree in Chemistry following the protocol set out in Annex III to this guide. This evaluation matrix has been elaborated from the document included in Annex I.

Once the oral and defense presentation session is concluded, the Evaluation Committee will open the envelopes containing the reports of the tutors and will deliberate on the qualification of the TFGQ submitted for its evaluation, taking into account the documentation presented by the students, the report of the instructor-tutor and the public presentation and defense of the works, in accordance with the evaluation criteria mentioned above.

Since the CB-1 and CB-4 competences, evaluated by the committee, are those that have the highest percentages in the final weighting of the TFGQ score, it is an indispensable condition to overcome the subject that the qualification awarded to the competences CB-1 and CB-4 is equal to or greater than 5 out of 10.

To pass the subject, the final grade awarded by the Evaluation Committee must be equal to or greater than 5 out of 10.

The Evaluation Committee of each generic topic will draw up and sign, in duplicate, an act in which the result of the evaluation, the final numerical score obtained by each student evaluated and the list of students not presented, if any, will be recorded. The President will publish one of the copies on the official bulletin board of the Center and will send the other to the Center Administration, along with the reports / assessment matrices of each student.

Each evaluating committee may propose a reasoned grant of the "Honors Matriculation" award to one or more TFGQ that it has evaluated and that have obtained a grade of 9 or higher. This motivation will have to include the innovative and excellent aspects that, in the opinion of the court, make him worthy of the aforementioned mention. The number of these mentions may not exceed 5% of the students enrolled in the corresponding subject of the TFGQ in each academic year, unless the number of students enrolled is less than 20, in which case a single "Honor Matrícula". In the event that the number of proposals for Honor Matters exceeds the number of mentions available, the Teaching Commission of the Degree in Chemistry, based on the reports / assessment matrices of the different courts and, as the case may be, The different presidents, will decide on the allocation of these mentions.

8. Resources, bibliography and complementary documentation

All the bibliographic resources and the accesses to the existing databases in the Faculty of Chemistry and in the Departments with headquarters in the Faculty building, will be at the disposal of the students enrolled in the subject.