Universidad Zaragoza

Academic Year/course: 2022/23

66017 - Master's Dissertation

Syllabus Information

Academic Year: 2022/23
Subject: 66017 - Master's Dissertation
Faculty / School: 100 - Facultad de Ciencias
Degree: 537 - Master's in Molecular and Cellular Biology
ECTS: 30.0
Year: 1
Semester: Annual
Subject Type: Master Final Project
Module:

1. General information

1.1. Aims of the course

The course and its expected results respond to the following approaches and objectives:

This compulsory subject of 30 credits is offered to students with the purpose of capturing the knowledge acquired and that which is acquired during the realization of a practical work that solves a specific scientific problem in a subject related to Molecular and Cellular Biology and/or with Biotechnology.

The master's final project's main objective is for the student to acquire research maturity, so that they are able to apply the appropriate experimental techniques and correctly express the results derived from work carried out in a research laboratory in the different scientific areas related to Biochemistry and Molecular Biology. Likewise, they must acquire the ability to assess and discuss the data obtained critically, comparing them with those already published in scientific journals. With this, students will acquire specific skills to carry out a professional profile demanded by the different companies related to biotechnology and by university or non-university departments and institutes dedicated to scientific research.

Although the works will be experimental, it is also contemplated, when justified and authorized by the quality assurance commission, that the students carry out their Master's thesis analyzing the bibliography on a specific and current topic to synthesize the state of knowledge and propose strategies for advancing it.

These approaches and objectives are aligned with the following Sustainable Development Objectives (SDGs) of the United Nations 2030 Agenda (https://www.un.org/sustainabledevelopment/es/), in such a way that the acquisition of the results of Subject learning provides training and competence to contribute to some extent to its achievement: Objective 1: No Poverty; Objective 2: Zero Hunger; Objective 3: Good Health and Wellness; Objective 4: Quality education; Objective 5: Gender equality; Objective 6: Clean water and sanitation; Objective 8: Decent work and economic growth; Objective 9: Industry, innovation and infrastructures; Objective 10: Reducing Inequality; Objective 11: Sustainable cities and communities; Objective 12: Responsible production and consumption; Objective 13: Climate Action; Objective 14: Underwater life; Objective 15: Life of land; Objective 16: Peace, justice and strong institutions and Objective 17: Partnerships to achieve the goals.

1.2. Context and importance of this course in the degree

This subject is the one with the greatest weight in a Master's degree that is mainly oriented towards research, since it comprises half of its ECTS. The Master's project integrates many of the scientific aspects that the student has addressed during their higher studies. With the Master's thesis, the student faces for the first time the realization of a research work, whenever possible of an eminently practical nature, in a totally individual way and where he must use and expand both the theoretical and technical knowledge that he has acquired. till the date. Through the development of the project, in active research groups and, in many cases, leaders in their field, students will acquire specific skills to carry out a professional profile of scientific research.

1.3. Recommendations to take this course

This subject (Final Master's Project, FMP) consists of carrying out, supervised by a professor from the Departments that teach in the master's degree or from the associated centers, an experimental research project. It is the one with the greatest weight in credits of the Master (30 credits) and its objective is that the student faces the realization of a research work in which he must use and expand the theoretical and practical knowledge that he has acquired up to that moment. This work can be carried out both in the laboratories of the research groups whose members participate in the Master's degree and in the companies or institutions with which the program concludes an agreement for this purpose (see list of research groups involved, examples of FMP topics and publications in sections 5.3 and 5.5 of this guide).

The Department's website (**bioquimica.unizar.es**) contains the most relevant information on the Research Groups, the lines

of research carried out by each group and the contact address of the responsible professors. Master's students are advised to visit this page to learn about and select the lines of research in which their Master's thesis will be framed.

In the case of projects carried out outside the laboratories of the research groups that participate in the Master, the coordinator of the same will propose a tutor professor, close to the subject of the work, involved in teaching and belonging to the responsible Departments of the Master: Departments of Biochemistry of Sciences and Veterinary Medicine, and Department of Microbiology of Medicine.

This subject has the following characteristics: ECTS credits: 30. Organization: Annual. Character: Mandatory.

The master's project will be proposed with simple and specific objectives that allow the student to carry out a research project appropriate to the 30 ECTS. The student must take into account the annual and compulsory nature of the subject.

Both the FMP written report, as well as the oral defense can be performed in English or in Spanish.

2. Learning goals

2.1. Competences

Upon passing the subject, the student will be more competent to:

- Propose and carry out the experiments that lead to solving a scientific problem applying the appropriate techniques in a laboratory.

- Express in writing the scientific results derived from experimental work carried out in a laboratory in the different areas related to Biochemistry and Molecular Biology.

- Evaluate and discuss the data obtained in the experimental work with a critical capacity, comparing them with those already published in scientific journals.

- Make a presentation and defense of their results orally with the help of audiovisual support, eg: PowerPoint presentation or similar, adjusting to a limited time.

- Assess and discuss the data obtained with expert scientists in the area of ??Molecular and Cellular Biology.

2.2. Learning goals

The student, to pass this course, must demonstrate the following results:

1. Performs the most frequent experimental tasks in a Biochemistry, Biotechnology and/or Molecular or Cellular Biology laboratory, including handling specialized instrumentation and advanced experimental techniques.
2. Is capable of designing experiments that lead to the resolution of a specific scientific problem.
3. Carry out experiments (and/or applications) independently and describe, quantify, analyze and critically evaluate the results obtained.
4. Knows the ways to search (specialized libraries and newspaper archives, consultation of on-line magazines and Internet databases) of the most recent and relevant biological information to solve technical and professional problems.
5. Is capable of critically reading the scientific literature in Molecular and Cellular Biology, and clearly perceiving current advances and possible future developments.
6. Is trained in communication and public presentation of the fundamental aspects of his professional activity to other professionals in his area or related areas and to a non-specialized public.
7. Has a basis for being original in the development and/or application of ideas, especially in a scientific research context.

2.3. Importance of learning goals

This subject is part of a Master with a clear vocation for scientific research. Scientific research is the most important activity in the completion of a Doctoral Thesis and the Master's project is the first individual experimental work that allows starting a research career. On the other hand, the biotechnological industrial sector is one of those that present the greatest development and expansion at the moment and direct knowledge of the operation of a research laboratory, as well as the most used techniques in the field of Biotechnology and/or o Molecular and Cellular Biology are essential to apply for a job in the research and development departments of the biomedical, pharmaceutical, agri-food industries, etc. dealing with applied aspects of these branches of knowledge. The learning obtained with this course is also of great interest to any professional who must carry out their work in molecular analysis, quality control and diagnostics laboratories, and it is very useful training for teamwork within a larger project.

3. Assessment (1st and 2nd call)

3.1. Assessment tasks (description of tasks, marking system and assessment criteria)

The student must demonstrate that they have achieved the intended learning outcomes through the following assessment activities:

The Master's project will be evaluated by a panel made up of three members from the Department of Biochemistry and Molecular and Cellular Biology and from other departments that participate in the teaching of the Master.

The Master project may be presented in any of the calls provided for in the academic calendar of the Faculty of Sciences, once the director/s of the work (and the lecturer, where appropriate) give the Approval

Important: the deposit of 1 written copy of the Memory will be requested in the Secretariat of the Faculty of Sciences, in addition to the electronic document and the forms established in the general regulations of the Faculty

The evaluation will consist of:

1. **Evaluation of a Memory** that must collect the work done (it will represent 60% of the final grade). The Report will be 40-60 pages long and must contain the following sections: Title, Background, Hypotheses and Objectives, Methodology, Results, Discussion, Conclusions and Bibliography. The report may be presented in Spanish or English and will include a summary and conclusions in both languages. (Recommended format: Font type: Times, Arial, Palatino, Verdana, Calibri; Font size: 12 points; Line spacing: 1.5).

The evaluation committee will assess formal and content aspects such as (**See assessment rubric at** https://ciencias.unizar.es/master-en-biologia-molecular-y-celular-2014-15):

1. Structure and extent of memory.
2. Updated and focused topic introduction.
3. Clear hypothesis and well defined objectives and conclusions.
4. Appropriate methodology, well explained and/or referenced.
5. Formally correct and understandable expression of the results.
6. Maturity of the interpretation and discussion of results.
7. Management of the bibliography.

2. **Assessment of an oral presentation** (30% of the final grade). The defense of the Master project will be public before a court appointed by the Department and published on the Faculty's website. The exposure time will be about 15 minutes, followed by a time for questions by the members of the evaluating committee.

The evaluating committee will assess the structure and clarity in the presentation, as well as the ability to respond to the questions posed and the mastery of the subject of the work carried out (**see assessment rubric at:** https://ciencias.unizar.es/master-en-biologia-molecular-y-celular-2014-15).

3. **Monitoring assessment of the work by the Director(s) (**10% of the final grade**; see assessment rubric at** https://ciencias.unizar.es/master-en-biologia-molecular-y-celular-2014-15).

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The learning process that has been designed for this subject is based on the following:

This subject is programmed so that, starting from a specific scientific problem, the student knows how to apply their theoretical knowledge and, above all, how to apply the techniques that are commonly used in a Molecular and Cellular Biology laboratory to solve the problem posed. The experimental work lasts for an academic year allowing the student to acquire the essential skills to move comfortably in a research laboratory and become familiar with the daily routine, in contact with an already structured research group. Likewise, the student will become familiar with the management of the bibliography and the sources of information appropriate to his project and will learn to prepare a report where the background of the subject, the objectives, the methodology developed and the organized results are collected in an orderly and precise manner. together with their interpretation and the conclusions derived from them. The oral presentation of said memory before a court and in a limited time also represents training and learning of great interest in the student's training. The CGCM will contemplate the possibility of authorizing a bibliographic review work as long as the proposal is adequately justified and especially in the event that, for health reasons or other major force, an experimental work cannot be carried out.

Both the Master's dissertation written report as well as the oral defense can be performed in English or in Spanish.

(See details at:**https://ciencias.unizar.es/master-en-biologia-molecular-y-celular-2014-15)**

4.2. Learning tasks

The program offered to the student to help him achieve the expected results includes the following activities:

This subject is structured in six main **learning tasks:**

1. The director of the work will propose a specific scientific problem to the student and the student must know the background of the problem to be solved by studying previous publications, works and theses related to it. You will also have to manage the scientific bibliography related to the topic in order to answer the following questions: What

is known about the topic, what similar problems have been solved and how have they been solved.

2. The director of the Master's thesis will guide the student when planning the experiments aimed at solving the problem to be solved. Together they will carry out a chronological planning of the studies to be carried out.
3. The student will learn and apply the appropriate experimental techniques to solve specific problems.
4. The student will learn to interpret the results obtained, to discuss them and to rethink new experiments together with the director of the master's thesis.
5. They will learn to prepare a scientific Report with the following sections: Background, Hypotheses and Objectives, Results and Discussion, Bibliography and, if applicable, Conclusions. At all times you will have the advice of the director of the Master's thesis.
6. Prepare an oral presentation with the help of audiovisual media such as Power Point or similar that will be supervised by the director of the Master's thesis and that will adjust to the established time and format.

Professors: from the Department of Biochemistry and Molecular and Cellular Biology, Faculties of Sciences, Veterinary Medicine and Health and Sports Sciences, from other related departments of the University of Zaragoza. Researchers from Aula-Dei (CSIC), IACS, Aragon's Institute of Health Sciences, CIBA, Biomedical Research Center of Aragon, BIFI, Institute for Biocomputing and Physics of complex systems, CITA, Center for Research and Food Technology of Aragon, and the INA, Institute of Nanoscience of Aragón. Researchers from private companies in the biotechnological and diagnostic field of Aragon may also direct Master's thesis, when approved by the CGCM (Master?s Quality Guarantee Commission).

The Master's thesis will be offered within the deadlines established by the Faculty (see guidelines at: https://ciencias.unizar.es/master-en-biologia-molecular-y-celular-2014-15).

The Department's website, which **is recommended to visit to guide the choice of the group and the director** with which to carry out the project, contains the most relevant information on the Research Groups, the lines of research carried out by each group and the contact address of the responsible professors (**bioquimica.unizar.es**).

4.3. Syllabus

Below are some examples of Master's thesis offered in previous courses:

- Prokaryotic FAD sinthetases (FADS): a potential pharmacologic target in therapy. Analysis of structure-function relationships and inhibitor design. (**Directors:** Dr. Milagros Medina and Dr. Ana Serrano**, BMCBD and BiFi).**

- Tumor stem cell activation effects of Granzyme A induced inflammation in colorectal carcinoma. **(Director:** Julian Pardo, IACS).

- Development and validation of a an immunochemical test for the diagnosis of invasive aspergillosis**. (Director:** Julian Pardo, **IACS).**

-Multifunctional nanoparticles for transport and selective delivery of anti-hepatitis C (VHC) drugs. **(Director:** Olga Abian, BiFi).

- Identification and characterization of new ionic cannel modulators for the treatment of neurological and cardiovascular diseases. **(Director:** Ralf Kohler, UIT-IACS).

- Functional analysis of polymorphisms in promoters involved in lipid metabolism. (**Directors:** Miguel Pocoví e Isabel de Castro **BMCBD and IACS).**

- Melatonin effect on the ovine reproductory system. **(Directors:** Adriana Casao Gascón and Rosaura Perez Pe, BMCBD Veterinary School**).**

- Functional effects of directed mutations in human Apoptosis Inducing Factor (hAIF). (**Directors:** Dr. Patricia Ferreira and Dr. Raquel Moreno-Loshuertos**, BMCBD and BiFi).**

-Search for pharmacological chaperones to rescue MeCP2 mutations involved in Rett síndrome. (**Directors:** Dr. Adrián Velázquez Campoy and Dr. Olga Albian, BiFi-IACS).

- In vitro antitumoral effects of BH3-mimetic compounds combined with the proteosomal inhibitor Carfilzomib and with PARP-1 inhibitor Olaparib. (**Director:** Isabel Marzo, **BMCBD**)

- Role of mtDNA genetic polymorphisms in Parkinson's disease. (**Directors**: Julio Montoya and Eduardo Ruiz-Pesini, **BMCBD**).

4.4. Course planning and calendar

Calendar of face-to-face sessions and presentation of works

The Master's final projects offered by the professors with the subject and contact e-mail address will be published in accordance with the calendar established by the Faculty (**See assessment guidelines at https://ciencias.unizar.es/master-en-biologia-molecular-y-celular-2014-15**) and publicity will be given, by the Department and the Master's coordinator, among the students enrolled at the beginning of the course.

The time schedule for assigning and presenting the FMP is published on the Faculty's website, where you can also find the proposal forms that must be completed.

The FMP proposals, as well as the composition of the tribunals that must assess them, will be approved by the Master's Guarantee Commission according to the established calendar.

The planning and development of the project activities will be decided in accordance with the indications of the director/s of the project, taking into account the student's dedication to the rest of the Master's subjects and the 30 credits assigned to the master's thesis.

The FMP may be presented in any of the official calls established through the forms and mechanisms specified on the website of the Faculty of Sciences. The reports will be submitted to the Secretary of the Faculty 8 school days before the date of defense of the FMP

The dates for the defense of the FMP will be agreed upon by the Faculty Board and published on the website of the Faculty of Sciences and on the board of the Department of Biochemistry in the Faculty of Sciences

As a guide, being able to modify according to the calendar of the course, the defense dates of the works will be in July (second week) and in September (second fortnight)

The research topics and the professors who offer them will be proposed following the official calendar established by the Faculty of Sciences and which can be found on its website

The planning and development of the project activities will be decided in accordance with the indications of the director(s) of the project, taking into account the student's dedication to the rest of the Master's subjects and the 30 credits assigned to the Master's thesis

The final Master's thesis may be presented in any of the official calls published on the website of the Faculty of Sciences: http://ciencias.unizar.es once the director of the work (and the lecturer, if applicable,) give the approval.

4.5. Bibliography and recommended resources

There is no specific bibliography. The director of the FMP will recommend to each student the appropriate bibliography for the project.