Universidad Zaragoza

Year : 2019/20

63102 - Bioactive molecules: identification, design & development

Syllabus Information

Academic Year: 2019/20
Subject: 63102 - Bioactive molecules: identification, design & development
Faculty / School: 100 - Facultad de Ciencias
Degree: 572 - Master's in Quantitative Biotechnology
ECTS: 6.0
Year: 1
Semester: First semester
Subject Type: Compulsory
Module: ---

1.General information

1.1.Aims of the course

1 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a context of research

2 - Students should be able to apply acquired knowledge and problem-solving skills in environments new or little known within broader (or multidisciplinary) contexts related to their area of ??study

3 - Students are able to integrate knowledge and confront the complexity of making judgments from information that, incomplete or limited, includes reflections on the social and ethical responsibilities associated with the application of their knowledge and judgments

4 - That the students know how to communicate their conclusions and the last knowledge and reasons that support them to specialized public and non-specialized services in a clear and unambiguous manner

5 - Students have the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.

1.2.Context and importance of this course in the degree

This course will allow the students learn about:

. Thermodynamics of equilibria and biomolecular interactions

· Development of identification bioassays

· Experimental and virtual screening of chemical libraries

· Analysis of natural products

· Toxicity, bioavailability and effectiveness tests

· Structure / activity relationships

· Tools for the design and engineering of proteins

· Stabilization, optimization and design of proteins

1.3.Recommendations to take this course

As a compulsory subject, BM is based on the knowledge acquired previously in the University Degrees that allow the students the access to this Master. Also, minimum English level is required (B2 or equivalent).

2.Learning goals

2.1.Competences

1- Formulate the basic equations and matter balances characteristic of simple ligand protein binding equilibria.

2 - Design assays for the identification of substances with predetermined biological activities

3 - Adapt identification assays to high throughput formats to screen large collections of candidate compounds

4 - Apply knowledge of molecular docking (docking) to the identification of binding compounds (Pharmacological or inhibitory chaperones)

5 - Design procedures for the analysis of natural products aimed at the identification of the active ingredient

6 - Designing cell and animal assays for toxicity, bioavailability and effectiveness of bioactive compounds

7 - Apply statistical techniques to carry out studies that relate molecular structure with biological activity and allow the generation of predictive models

8 - Identify appropriate protein engineering techniques to modify or combine preexisting protein functions

9 - Design strategies for target protein stabilization

2.2.Learning goals

1 - Order, analyze critically, interpret and synthesize information

2 - Obtain information from different types of sources and evaluate their reliability

3 - Learn efficiently through autonomous study and acquire a significant degree of independence

4 - Apply acquired knowledge and solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to the area of ??study

5 - Formulate, analyze, evaluate and compare new or alternative solutions to different problems

6 - Be able to work in multidisciplinary and international teams

7 - Develop capacity for criticism and self-criticism

8 - Make decisions taking into account social, ethical and legal responsibilities

9 - Be able to develop a project, participating in the stages of bibliographic search, experiment planning, obtaining results, interpreting, and disseminating them

2.3.Importance of learning goals

1 - Manage in an adequate way the resources and the available time for the resolution of a problem or the development of a draft

2 - Communicate own conclusions and the latest knowledge and reasons that support them - to specialized audiences

3 - Transmit information in an oral, written or graphic form using appropriate presentation tools and with the limitations imposed by time or space

4 - Communicate fluently in English (understanding scientific texts, writing reports, lectures, colloquiums, exhibitions, etc.)

5 - Use Information and Communication (ICT) techniques as a tool for expression and communication

6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a context of Research

7 - Develop technological applications of biochemical processes and transfer solutions to the industry in the food, chemical, cosmetic, pharmaceutical or health sector

3.Assessment (1st and 2nd call)

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

Homework (35/100): Preparing a report about a topic related to the course. The report will be prepared individually or in groups of two students. It will evaluate according to the structure in sections (introduction, methodology, results, discussion, conclusions and references), considering how the student describe in a clear way the problem statement, describe properly the methodology, and the results in a logic and sequential way, give original ideas in the description, provide conclusions justified by the job and reports the appropriate the references in literature.

Written Test (50/100): It will comprise of questions that requires short or long answers. Short ones will allow performing a comprehensive sampling of the student knowledge and long ones will allow students to exhibit their expression capabilities in presentation and sustain argumentations, and critical judgments. This written test will be based on the learning activity program.

Seminars (15/100): Report preparation and public presentation and defense about a topic related to the course. This report will be individual or in two group student. The presentation sessions will have seminar format. 10-15 minutes for presentation and defense. The work will be evaluate according to its structure (coherent) and appropriate literature reference contained; clarity and tidiness during the presentation; maturity during debate.

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The methodology followed in this course is oriented towards achievement of the learning objectives. It favors the understanding of the different chemical processes that occur in the environment. A wide range of teaching and learning tasks are implemented, such as theory sessions, laboratory sessions, assignments, and tutorials.

Students are expected to participate actively in the class throughout the semester.

Classroom materials will be available via Moodle. These include a repository of the lecture notes used in class, the course syllabus, as well as other course-specific learning materials.

Further information regarding the course will be provided on the first day of class.

4.2.Learning tasks

The course includes 6 ECTS organized according to:

- **Theory sessions** (0.8 ECTS): 20 hours. Lecture notes and a series of problems (and their solutions) will be available for the students. At the end of each topic, some of the problems will be solved in class by the professor and the rest will be done individually. The professor will also assign, from those unsolved problems, 2 problems to groups of 4-5 students, which later they will submit.

- **Laboratory sessions** (1.6 ECTS): 40 hours. Sessions last 4 hours, where students will be provided with the practical exercises' instructions to be done as well as a theoretical introduction to the session's contents.

- **Assignments** (3.6 ECTS): 90 hours.

4.3.Syllabus

The course will address the following topics:

A) Theory sessions

Topic 1. Designing and optimization of drugs: Current clinical needs of new drugs identification; Stages of drug development; Therapeutic targets; Development process difficulties; Failure Reasons

Topic 2. Strategies for new drug candidates' identification

Topic 3. From ?in vitro? identification of bioactive substances to ?in vivo? testing

Topic 4. Biomolecular Engineering: Tools for protein and nucleic acids

Topic 5. Enzymatic Engineering

Topic 6. Drug delivery

Topic 7. New products commercialization: Examples of New drugs development (Neutralizing antibodies and Enzyme replacement therapy (ERT)). Biotechnological Market for Bioactive compounds.

B) Laboratory sessions

Students will attend sessions of 4 hours each at BIFI laboratories.

They will be related to some of the theory sessions' topics (Experimental screening of chemical libraries, biomolecular engineer, Drug toxicity tests in cells...). Attendees will combine experiments and experimental data processing.

4.4.Course planning and calendar

For further details concerning the timetable, classroom and further information regarding this course please refer to the "Facultad de Ciencias" and the Department website (https://bioquimica.unizar.es/).

Exams call, exams dates and academic calendar in general can be check in the webpage:
http://ciencias.unizar.es/web/horarios.do

Theory sessions: Monday 10:00-12:00; Tuesday 11:00-14:00; Thursday 10:00-11:00.

Lab practices, Homework, Oral presentations and written test will be announced.

4.5.Bibliography and recommended resources

Teachers will provide some original research papers to work with.