UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Medicinal Chemistry

2627-2-F5402Q032

Aims

GENRAL AIMS
This course provides students with the basic principles of pharmaceutical chemistry and rational drug design. Since this academic year (2020-2021) a credit will be taught by Prof. Francesca Magli of Di.SEA.DE, who will provide a series of insights on the economics of drug development and about the innovation in the process of drug development.

The teaching objectives are as follows:

KNOWLEDGE AND UNDERSTANDING ABILITY

At the end of this training activity, the student must demonstrate to be able to read a scientific article dealing with the rational design of new pharmacologically active compounds, the drug development (hit to lead), the pharmacokinetic. To achieve this goal during the course a series of very recent articles are analyzed that explain and exemplify the topics covered. The course provides the student with specific knowledge in the following areas:

1 Structure- and ligand-based drug design

2 hit to lead development

3 pharmacological targets (proteins, nucleic acids)

4 pharmacokinetic

5 Supply chain of drug development (Prof. F. Magli)

6 stories of successful drugs

CAPACITY TO APPLY KNOWLEDGE AND UNDERSTANDING

At the end of this training activity, the student must demonstrate that he is able to:

1 Draw a ligand given a pharmacological target

2 Imagine the development of a new lead

3 Imagine how to expand an existing group of congeneric drugs (with the same action and the same target)

JUDGMENT AUTONOMY

At the end of this training activity, the student must demonstrate to be able to critically read a scientific article, analyze its contents, judge any weaknesses and strengths of the article, foresee possible experimental and application limitations, imagine creatively further developments of the technique presented by the article. The teacher stimulates the critical discussion of the articles presented in class in order to accustom the student to this type of analysis of scientific literature.

COMMUNICATION SKILLS

Some students may present in-depth studies of specific topics that are then discussed together in class. Class presentations are an important moment in learning the ability to communicate scientific data through a presentation.

LEARNING SKILLS

Expected results:

1 Collect and understand the new information needed to rationalize the properties of new drugs

2 Collect and understand information about the development of new targets and new leads

3 Economic and management aspects of the drug development process (F. Magli)

Contents

Rational drug design (structure and ligand-based), drug development (from hit to lead), pharmacokinetic, metabolism of drugs, prodrugs, strategies in drug release, examples of drug development, elements of economy and management applied to the pharamceutical industry, personal work

Detailed program

1) rational drug design: ligand- and structure-based drug design

2) drug development: from hit to lead

3) pharmacokinetic (liberation, adsorption, distribution, metabolism, excretion, toxicity). oxidative, reductive, conjugative metabolism

4) Targets and mechanisms of action of drugs

5) Classes of drugs (pharmacodynamic): anti-inflammatory, antiviral drugs , antibiotics, anti-hypertensive drugs, other drugs

6) biological vs chemical drugs

7) drug carriers: polymers and nanoparticles, the nanomedicine

8) smart drugs: prodrugs, smart polymers

9)Elements of economy and management applied to the pharmaceutical industry. The drug supply chain, the contribution of technology innovation in drug development and the drug logistics (F. Magli, 2 credits)

Prerequisites

Background. The course is intended for students who have a general basis in chemistry and biology. Advanced knowledge of organic chemistry is not necessary, the necessary concepts are reviewed during the lessons.

Teaching form

6 CFU (42 hours) of lessons divided as follows:
14 lessons of 2 hours of **didactic teaching (DE) in the presence** of explanation of the main topics of the course
7 hours lesson (3 lessons) of **didactic teaching (DE) in the presence** by Prof. Francesca Magli on economic and management aspects of Pharma Industry
7 hours of **interactive teaching mode (DI) in the presence** of presentation and discussion in class of the students' in-depth work

Textbook and teaching resource

Slides and scientific papers available at the e-learning platform of the course.

Semester

First semester

Assessment method

Oral exam only based on an interview on the topics covered in class and on in-depth analysis of scientific literature. Some students decide to delve deeper into a topic in the form of a **short essay** by making a presentation during the lectures (a block of 2-3 lectures at the end of the course is dedicated to in-class presentations).
For Prof. Magli's part, 2 cfu, on the economic aspects of the pharmaceutical industry, there is a final exam in the

form of a **closed-answer test**.
Composition of the grade: **the grade is composed of 5/6 of the oral grade and 1/6 of the closed-answer test grade
Grade ranges:
18-19: preparation on a small number of topics in the course program, many gaps and limited critical processing ability;
20-23: preparation on a part of the topics in the course program, independent analysis ability only on purely practical and executive issues, use of inaccurate vocabulary and rather uncertain expository ability;
24-27: preparation on a large number of topics covered in the course program, ability to independently carry out argumentation and critical analysis, ability to apply knowledge to contexts and connect themes to concrete cases, use of correct vocabulary and competence in the use of disciplinary language;
28 – 30/30L: complete and exhaustive preparation on the topics in the exam program, personal ability to deal autonomously and critically analyze the topics, ability to reflect and self-reflect and to connect the topics to concrete cases and different contexts, excellent ability to think critically and autonomously, full mastery of the disciplinary vocabulary and a rigorous and articulated expository ability, ability to argue, reflect and self-reflect, ability to connect to other disciplines

Office hours

Contact: on demand by email to the lecturer.

Sustainable Development Goals

GOOD HEALTH AND WELL-BEING