

## School of Pharmacy

### Department of Medicinal Chemistry

#### Course information:

Department: Medicinal Chemistry  
Course title: Medicinal Chemistry I  
Credit (Theory or Practical): 3 Credits (Theory)  
Responsible Lecturer: Dr. Azizian  
Course Lecturers: Dr. Mokhtari, Dr. Azizian, Dr. Mirfazli  
*Prerequisite:* Organic chemistry II, Pharmacology I

#### Responsible Lecturer information:

Academic rank: Associate Professor  
Department: Medicinal Chemistry  
Faculty: School of Pharmacy  
Address: End of Shahid Basarti Street, Shahid Kabiri Tameh Street (North Shahin), Shahid Hemmat Highway to the west, Tehran, Iran  
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#### Course Description:

Medicinal Chemistry I introduce the principles of drug design, development, and action at the molecular level. The course focuses on the relationship between chemical structure and biological activity (Structure-Activity Relationships, SAR), drug-receptor interactions, and the physicochemical properties that influence drug absorption, distribution, metabolism, and excretion (ADME). Students will understand of SAR of selected drug classes (Antibiotics, Antivirals and Anticancer) and analyze the mechanisms of action for various therapeutic agents.

#### Topics typically include:

- Introduction to medicinal chemistry and drug discovery
- Physicochemical properties of drugs (lipophilicity, solubility, ionization)
- Drug-receptor interactions and binding forces
- Structure-Activity Relationships (SAR)
- Pharmacokinetics and pharmacodynamics basics
- Metabolism of drugs and prodrug design
- Overview of key drug classes (e.g., anticancer, antibiotics, antivirals)

## - Course objectives:

By the end of this course, students will be able to:

1. **Understand the fundamental principles** of medicinal chemistry, including structure–activity relationships (SAR), physicochemical properties of drugs, and their influence on pharmacokinetics and pharmacodynamics.
2. **Describe the drug discovery and development process**, from target identification to lead optimization and clinical trials.
3. **Apply knowledge of organic and physical chemistry** to explain drug design, synthesis, metabolism, and mechanisms of action.
4. **Analyze the relationship between chemical structure and biological activity** of drugs in major therapeutic classes (e.g., anticancer, antibiotics, antivirals drugs).
5. **Evaluate the role of functional groups** and stereochemistry in drug–receptor interactions and biological activity.
6. **Identify common strategies for drug modification**, such as bioisosterism, prodrug design, and optimization for ADME properties.
7. **Develop problem-solving skills** through case studies related to drug design, molecular interactions, and clinical applications.
8. **Integrate medicinal chemistry concepts** with pharmacology and pharmaceutical sciences to understand rational drug therapy.
9. **Discuss** structure–activity relationships (SAR) for representative drug classes.
10. **Recognize the role of functional groups** and stereochemistry in drug–receptor interactions.
11. **Interpret case studies** involving modifications of drug structures to improve efficacy or reduce side effects.
12. **Integrate chemical knowledge** with pharmacological concepts to rationalize therapeutic applications.

## Educational approach:

Virtual

In person

Blended

## Teaching-learning methods with regard to the chosen educational approach:

### In person approach

Interactive lecture (question and answer, quiz, group discussion, etc.)

Small group discussion

- Team-based learning (TBL)  
 Problem-based learning (PBL)  
 Scenario-based learning  
 Using students in teaching (peer teaching)  
 Game-based learning  
 Name others.....

## Medicinal Chemistry I Course Plan (M-Pharm)

### Wednesdays 10-13

	Subject	Lecturer	Date
1	Receptor character, Pharmacophore and lead optimization	Dr. Mirfazli	<b>07-02</b>
2	Molecular modification-Isosterism	Dr. Mirfazli	<b>07-09</b>
3	Receptor; interaction effect, conformation and stereochemistry in drug receptor affinity	Dr. Mirfazli	<b>07-16</b>
4	Drug physicochemical properties; Acid-base character; Pka, ionization prediction, solubility	Dr. Mirfazli	<b>07-23</b>
5	Sulfonamide	Dr. Azizian	<b>07-30</b>
6	Penicillin	Dr. Azizian	<b>08-07</b>
7	Penicillin	Dr. Azizian	<b>08-14</b>
<b>Exam 1 of sessions 1-4</b>			<b>08-14 12:00 am</b>
8	Cephalosporin	Dr. Azizian	<b>08-21</b>
9	Cephalosporin, Carbapenems	Dr. Azizian	<b>08-28</b>
10	Aminoglycosides, Macrolides	Dr. Mokhtari	<b>09-05</b>
11	Tetracyclines	Dr. Mokhtari	<b>09-12</b>
12	Quinolones	Dr. Mokhtari	<b>09-19</b>
<b>Exam 2 of sessions 5-9</b>			<b>09-19 12:00 am</b>
13	Antiviral drugs	Dr. Mirfazli	<b>09-26</b>
14	Antiviral drugs	Dr. Mirfazli	<b>10-03</b>
15	Anticancer agent	Dr. Mirfazli	<b>10-10</b>
16	Anticancer agent	Dr. Mirfazli	<b>10-17</b>
<b>Final Exam (10-16 sessions)</b>			

## Student Duties and Expectations:

Students are expected to attend class regularly, complete assignments on time, study assigned resources, and actively participate in class activities throughout the course.

## Important notes:

Students are allowed a maximum of three absences. More than three absences will result in course grade of zero.

## Student Assessment Method:

Lecturer	Exam 1	Exam 2	Class Score	Final Exam
Dr. Mirfazli	4	-	1.6	4
Dr. Azizian	-	5	1	-
Dr. Mokhtari	-	-	0.6	3

## References:

- 1- **Foye's principles of medicinal chemistry**, last Edition. Philadelphia; by Lippincott Williams & Wilkins
- 2- **Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry** last Edition; by Jr. Beale, John M. (Editor), John H. Block (Editor)
- 3- **Essentials of Foye's Principles of Medicinal Chemistry** last Edition; by Thomas L. Lemke PhD (Author), S. William Zito PhD (Author), Victoria PhD F. Roche PhD (Author), David A. Williams PhD (Author)
- 4- **Review of Organic Functional Groups: Introduction to Medicinal Organic Chemistry**; by Zito PhD, S. William, Roche PhD, Victoria F., Lemke PhD, Thomas
- 5- **An Introduction to Medicinal Chemistry last Edition**; by Graham L. Patrick