Course Specification
(Bachelor)

Course Title:	Medicinal Chemistry
Course Code:	CHM 1328
Program:	Bachelor of Science in Chemical Laboratories
Department:	Chemistry
College:	Science
Institution:	Imam Mohammad ibn Saud Islamic University (IMSIU)
Version:	2024-1
Last Revision Date:	15 September 2024

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (3) 3 (3 Lectures, 0 Lab, 0 Tutorials)					
3 (3 Lectures, 0 Lab, 0 Tutorials)					
2. Course type					
A.	☐University	☐College	☐Department	☐Track	☐Others
B.	☐Required		☒ Elective		
3. Level/year at which this course is offered: (Level 5/year 3)					
4. Course General Description:					
This course provides students with an introduction to chemical principles that are required to understand the action and behavior of drug compounds and, hence, the relationship between the structure of a compound and its chemical and therapeutic properties, and thus, the chemical considerations in drug design. Methods of drug discovery will be described and will include Drug-Target Interactions, Review of Organic Functional Groups and Acid-Base Concepts, Fundamentals of Neurochemistry, Enzymes as Drug Targets, Receptors as Drug Targets, and Selected Examples of Drug Action at some Common Target Areas.					
5. Pre-requirements for this course (if any)**:**					
Organic Chemistry, CHM 1225					
6. Co-requisites for this course (if any)**:**					
None					
7. Course Main Objective(s):					

At the end of this course, the student will be able to:

- ✓**To introduce the structure and properties of medicinal agents with a shortcut about its metabolites.**
- ✓**To provide the basic knowledge of the relationship between different classes of organic compounds based on their chemical structures and activities.**
- ✓**To become more familiar with drug-receptor interaction and types of chemical functions involved in drug-receptor interaction.**
- ✓**To rationalize the structure-activity relationship (SAR), regarding chemistry structures and the mode of action on the target.**

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	**45**	**100 %**
2	E-learning	**0**	**0**
3	Hybrid • Traditional classroom • E-learning	**0**	**0**
4	Distance learning	**0**	**0**

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	**45**
2.	**Laboratory/Studio**	**0**
3.	**Field**	**0**
4.	**Tutorial**	**0**
5.	**Others (specify)**	**0**
Total		45

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**To recognize the principles of medicinal chemistry and drug discovery**	**K1, K3**	• Three hours are weekly, containing lectures. • A Private study, including work on the home exam. Students are encouraged to make regular visits during office hours where they can ask any question about the course.	**Direct:** ✓ Quizzes, exams ✓ Assignments ✓ Discussions. ✓ Participation
1.2	**To outline the pharmacological activity of several major groups of drugs**	**K1, K3**	• Three hours are weekly • group discussions. • A Private study, including work on homework.	**Direct:** ✓ Quizzes ✓ Assignments. ✓ Oral Discussion
1.3	**To state all aspects of the drug discovery process, from lead compound discovery**	**K1, K4**	• Three hours of weekly lectures • group discussions. • A Private study, including work on homework.	**Direct:** ✓ Midterms. ✓ Assignments ✓ Oral Discussions. ✓ Quizzes.

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	to the optimization of biological activity		Think and talk about the Lead Drug Discovery approach and biological optimizations.	
1.4	**To list important human diseases and assess current therapeutic approaches.**	**K1, K3**	• Three hours weekly lectures • group discussion. Think, talk, and discuss the treatment of human diseases.	**Direct:** ✓Midterms. ✓Assignments ✓Oral Discussions. ✓Quizzes. Final exam
2.0	**Skills**			
2.1	**To evaluate the chemical structures information and pharmacological activity relations**	**S3, S4**	• Lectures activity Think and talk about the chemical structures and pharmacological activity	**Direct:** ✓Questions in Lecture ✓Short Quizzes and Exams. ✓Participation ✓Oral Discussion, Home Exam.
2.2	**To predict the pharmacological activity based on the chemical function group**	**S3,S4**	Introduce some concepts of the Structure-activity relationship	**Direct:** ✓Questions in Lectures ✓Participation ✓Oral Discussion ✓Short Quizzes and Exams.
2.3	**To interpret the mode of action of organic compounds**	**S1, S3**	Encourage students to exchange their chemical thinking and to work and discuss cooperatively with their peers to develop individual skills.	**Direct:** ✓Questions in Lecture ✓Short Quizzes and Exams.
2.4	**To summarize different approaches for target lead compounds.**	**S2, S3**	• Brain Storms Exercises • Group Discussion Could ask and answer questions as they arise.	**Direct:** ✓Oral Discussion. ✓Group Discussion ✓Assignments

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
3.0	**Values, autonomy, and responsibility**			
3.1	**To appraise teamwork and create awareness to maintain scientific integrity during different assessments, projects, and mini-projects.**	**V2**	**Group discussion, assignments, and homework**	Direct ✓Oral tests, ✓Assignments and homework marks ✓Mini projects
3.2	**Develop personal values and attributes such as honesty, empathy and respect for others**	**V1, V2**	**Teamwork and class discussions**	Direct Mini projects
...				

C. Course Content

No	List of Topics	Contact Hours
1.	**Course Introduction and Importance of Medicinal Chemistry:** Understanding Drug Action, Drug Discovery and Development Process, List of physicochemical properties related to drug	6
2.	**Target Interactions:** Structural Effects on Biological Action, Role and Types of Chemical Bonding Interactions between Drug and Target, Binding of Neurotransmitters to Their Receptors	6
3.	**Review of Organic Functional Groups and Acid-Base Concepts:** Chemical bonding, Functional groups, Electron donating and withdrawing groups, Acids and bases, Henderson-Hasselbach equation; Estimating, pKa and pKb; Heterocycles	6
4	**Fundamentals of Neurochemistry:** Structures, Chemical Properties, Metabolism, and Actions of Select Neurochemicals Including Acetylcholine, Epinephrine, Norepinephrine, Dopamine, Serotonin, Glutamate, GABA, and Nitric Oxide) and of Nicotine**.**	6
5	**Enzymes as Drug Targets: a** brief review of amino acids, protein structure, enzyme classes, Mode of Action: theory of enzyme catalysis, Regulation Kinetics: Multisubstrate mechanisms Inhibitors: Reversible, Irreversible inhibitors, Pharmaceutical Concerns: Ki and IC50.	12
6	**Oligonucleotides as Drug Targets:** Nucleic Acids: a brief review of DNA/RNA structure/function, Oligonucleotide Recognition: base pairing, electrostatics,	6

	intercalation, groove binding, Interference with Nucleic Acid Synthesis and Function.	
7	**Selected Examples of Drug Action at some Common Target Areas:** Examples of drugs that disrupt cell membranes and walls Antifungal agents, Antibacterial agents, Ionophoric antibiotic action,Cell wall synthesis inhibition, Drugs that target enzymes, Reversible inhibitors, Irreversible inhibition, Transition state inhibitors, Drugs that target receptors Agonists, Antagonists, Partial agonists, Drugs that target nucleic acids, Antimetabolites, Enzyme inhibitors, Intercalation agents, Alkylating agents, Antisense drugs, Chain cleaving agents Antiviral drugs	3
Total		**45**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm 1	Week 6th - 7th	20 %
2.	Midterm 2	Week 11th -12th	20 %
3.	Quizzes, homework, class participation	During semester	20 %
.4	Final examination	Week 16th	40 %
5	Total		100%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	1. **Beale** Jr.,John M., Block, John, LWW; **Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry** 12 edition (March 2, 2010), ISBN10: 0781779294 2. Stromgaard, K, Krogsgaard-Larsen, P., Madsen, U, **Textbook of Drug Design and Discovery,** CRC Press; 4 edition, 2009, ISBN-10: 1420063227
Supportive References	Cairns, D., Essentials of Pharmaceutical Chemistry , Pharmaceutical Press; 3rdRevised edition, 2008, ISBN-10: 0853697450
Electronic Materials	• Blackboard • Journal of Medicinal Chemistry, ACS • Organic Letters, ACS • Organic and Biomolecules Chemistry, RSC

Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	**Each classroom should have a whiteboard and a projector, with a maximum of 20 students.**
Technology equipment (projector, smart board, software)	**The rooms have data show, Smart Board, and WI-FI access.**
Other equipment (depending on the nature of the specialty)	

F. . Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**Students**	• **Direct:** Questionnaire.
	Course Responsible	• **Direct**: Course e-Portfolio. **Indirect:** Second examiner checklist-Course report.
	Peer Reviewer	• **Direct:** Questionnaire. Indirect: External assessor report.
Effectiveness of Students assessment	**Program Leaders**	• **Direct:** Course e-Portfolio.
Quality of learning resources	**Students**	• **Indirect:** Second examiner checklist-Course report.
	Faculty (Academic Advisory)	• **Direct:** course Entrance/Exit. • **Indirect:** Observations - Accreditation review.
	Program Leaders	• **Direct:** Course e-Portfolio. • **Indirect:** Course evaluation survey-

Assessment Areas/Issues	Assessor	Assessment Methods
		Observations- Syllabus review- Accreditation review.
The extent to which CLOs have been achieved	**Course Responsible**	• **Direct**: Exams - Course e-Portfolio. **Indirect**: Second examiner checklist-Course report.
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify)
Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**COUNCIL OF DEPARTMENT OF CHEMISTRY**
REFERENCE NO.	**3 (NO. 1/3)**
DATE	**5/3/1446- 8/09/2024**