Course Specification
(Bachelor)

Course Title:	Medicinal Chemistry
Course Code:	CHM 1323
Program:	Bachelor of Science in Chemistry
Department:	Chemistry
College:	Science
Institution:	Imam Mohammed Ibn Saud Islamic University
Version:	2024 V 1
Last Revision Date:	14 October 2024

Table of Contents

A. General information about the course:

-1. Course Identification

1. Credit hours: 2 (2,0, 0)					
2(2 Lectures, 0 Tutorials, 0 Lab)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☐ Required		☒ Elective		
3. Level/year at which this course is offered: Level 5 , 6/ 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 (2)- CHM 1221					
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 short cut about its metabolites.**
- **To provide the basic knowledge of the relationship between different classes of organic compounds based on their chemical structures and their 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), in terms of 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	**30**	**100%**
2	E-learning	**0**	**0**
3	Hybrid	**0**	**0**

No	Mode of Instruction	Contact Hours	Percentage
	• Traditional classroom • E-learning		
4	Distance learning	0	0

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	**30**
2.	**Laboratory/Studio**	**0**
3.	**Field**	**0**
4.	**Tutorial**	**0**
5.	**Others (specify)**	**0**
Total		30

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

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**To recognize the principles of medicinal chemistry and drug discovery**	**K1; K3;**	• Two hours are weekly, containing lectures. • A Private study including work on the home exam.	• Quizzes • Assignments • Oral Discussion • Participation.
1.2	**To outline pharmacological activity of several major groups of drugs**	**K1; K3**	• Two hours are weekly containing lectures with group discussion. • Group discussion	• Assignments. • Quizzes. • Final exam.
1.3	**To state all aspects of the drug discovery process, from lead compound discovery to the optimization of biological activity**	**K3**	• Group discussions. • A Private study, including work on homework. • Think and talk about Lead Drug Discovery approach and	• Midterms. • Assignments. • Oral test • Quizzes. • Final exam.

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
			biological optimizations.	
1.4	**To list important human diseases and assess current therapeutic approaches.**	**K3**	• Group discussion. • Outline and discuss about therapeutic treatment of human diseases.	• Midterms. • Assignments • Oral Discussions. • Quizzes. • Final exam.
2.0	**Skills**			
2.1	**To evaluate the chemical structures information and pharmacological activity relations**	**S1,S2**	• Lectures activity • Think and talk about the chemical structures and pharmacological activity	• Questions in Lectures. • Short Quizzes and Exams. • Participation through Classwork and Homework.
2.2	**To predict the pharmacological activity based on the chemical function group**	**S1, S2, S3**	Introduce some concepts of Structure activity relationship	• Questions in Lectures. • Short Quizzes and Exams. • Participation • Oral Discussion and Homework.
2.3	**To interpret the mode of action of organic compounds**	**S1, S3**	Encourage students to exchange their chemical thinking, and cooperatively with their peers to develop individual skills.	• Questions in Lectures. • Short Quizzes and Exams. • Participation. • Oral Discussion and Homework
2.4	**To summarize different approaches for target lead compounds**	**S1; S3; S4**	• Encourage students to outline some aspects of target lead compounds.	• Questions in Lectures. • Short Quizzes and Exams. • Oral Presentation • Participation
3.0	Values, autonomy, and responsibility			
3.1	**To show intellectual and scientific integrity during assignments, projects, and reports**	**V1; V2**	▪ Group Discussion and Assignments.	▪ Oral Tests and Assignments Marks

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 physico-chemical properties related to drug	3
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.	5
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	4
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.	4
5.	**Enzymes as Drug Targets:** 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.	4
6.	**Oligonucleotides as Drug Targets:** Nucleic Acids: brief review of DNA/RNA structure/function, Oligonucleotide Recognition: base pairing, electrostatics, intercalation, groove binding, Interference with Nucleic Acid Synthesis and Function.	5
7.	**Selected Examples of Drug Action at some Common Target Areas:** Examples of drugs that disrupt cell membranes and walls Antifungal agent, Antibacterial apents , Ionophoric antibiotic action ,Cell wall synthesis inhibition, Drugs that target enzymes, Reversible inhibihors, 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.	5
Total		30

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes, Attendance, Participation, Home Exams	All the semester	20 %
2.	Midterm Exam 1	Around 6th & 7th week	20 %
3.	Midterm Exam 2	Around 11th & 12th week	20 %
4.	Final Exam	Around 16- 17th week	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	**Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry, Beale** Jr.,John M., Block, John, LWW; 12 edition (March 2, 2010), ISBN10: 0781779294 **Textbook of Drug Design and Discovery,** Stromgaard, K, Krogsgaard-Larsen, P., Madsen, U, CRC Press; 4 edition, 2009, ISBN-10: 1420063227
Supportive References	**Essentials of Pharmaceutical Chemistry**, Cairns, D., Pharmaceutical Press; 3rdRevised edition, 2008, ISBN-10: 0853697450
Electronic Materials	• Blackboard • Journal of Medicinal Chemistry, ACS • Organic Letters, ACS • Organic and Biomolecules Chemistry, RSC • European Journal Of Medicinal Chemistry • http://www.sigmaldrich.com • European Journal Of Pharmaceutical Chemistry • ACS Medicinal Chemistry Letter
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Each of the class room should be equipped with a whiteboard and a projector, with a maximum of 20 students.
Technology equipment (projector, smart board, software)	The rooms are equipped with data show, Smart Board, WI-FI access.
Other equipment (depending on the nature of the specialty)	• None

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.

Assessment Areas/Issues	Assessor	Assessment Methods
		Indirect: External assessor report.
Effectiveness of Students assessment	**Program Leaders**	**Direct:** Course e-Portfolio. **Indirect:** Course report.
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- 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.
	Program Leaders	**Indirect:** Exams.
Lab Performance	**Students** **Course Responsible**	**Direct:** Lab reports, Final Lab exam, Course e-Portfolio.

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**COUNCIL OF DEPARTMENT OF CHEMISTRY**
REFERENCE NO.	**7 (NO. 2/3)**
DATE	**29/3/1446 - 2/10/2024**