Kafr el-Sheikh university
Faculty of Pharmacy
Clinical (Pharm-D) program
Course Specification
2025/2026

Clinical (Pharm-D) program
Course Specification
2025/2026
Fourth Level
First Semester

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Course Specification
(2025)

1. Basic Information

Course Title (according to the bylaw)	Medicinal Chemistry I
Course Code (according to the bylaw)	PC 704
Department/s participating in delivery of the course	Pharmaceutical Chemistry Department
Number of credit hours/points of the course (according to the bylaw)	Theoretical / Practical / Other (specify) / Total 2 / 1 / ---- / 3
Course Type	Compulsory
Academic level at which the course is taught	Fourth level, semester (1)
Academic Program	Bachelor of Pharmacy (Pharm-D) (Clinical Pharmacy)
Faculty/Institute	Faculty of Pharmacy
University/Academy	Kafrelsheikh University
Name of Course Coordinator	Associate. Prof. Rofida Salem
Course Specification Approval Date	9/2025
Course Specification Approval	Department Council

2. Course Overview (Brief summary of scientific content)

This course covers the chemistry of different classes of: ANS, Cardiovascular agents, chemotherapeutic agents, autonomic nervous system, antifungal, antiviral drugs, anti-TB, anti-protozoal and antimalarials, SAR (Structure-activity relationship) of different classes of drugs, the effect of molecular modifications on the absorption, distribution, metabolism, and target binding of drugs, and pharmacopeial methods of assay for drugs in different dosage forms.

3. Course Learning Outcomes CLOs

Matrix of course learning outcomes CLOs with program outcomes POs (NARS/ARS)

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	Text	Code	Text
Domain 1 (Fundamental Knowledge) **1.1-COMPETENCY**		**Upon completing this course, students will be able to integrate knowledge from basic and applied pharmaceutical and clinical sciences to standardize materials, formulate and manufacture products, and deliver population and patient-centered care.** **This competency will be developed via the following key elements:**	
1.1.1	Demonstrate understanding of knowledge of pharmaceutical, biomedical, social, behavioral, administrative, and clinical sciences.	**1.1.1**	Describe the fundamental principles of medicinal chemistry including drug structure, physicochemical properties, and biological activity.
		1.1.2	Recognize the role of functional groups in determining drug activity and therapeutic profile.
		1.1.3	Explain how chemical properties of drugs affect pharmacological action and clinical use.
1.1.3	Integrate knowledge from fundamental sciences to handle, identify, extract, design, prepare, analyze, and assure quality of synthetic/natural pharmaceutical materials/products.	**1.1.4**	Discuss the extraction and identification of natural compounds with medicinal importance.
		1.1.5	Correlate structural modifications with activity changes in drug classes (SAR).
		1.1.6	Apply chemical knowledge to ensure identity, purity, and quality of medicinal agents.

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
1.1.4	Articulate knowledge from fundamental sciences to explain drugs' actions and evaluate their appropriateness, effectiveness, and safety in individuals and population.	**1.1.7**	Explain drug–target interactions (enzymes, receptors, nucleic acids) at the molecular level.
		1.1.8	Relate structural features of drugs to their mechanisms of action and therapeutic applications.
		1.1.9	Predict adverse effects and drug interactions based on chemical and metabolic pathways.
1.1.6	Utilize scientific literature and collect and interpret information to enhance professional decisions.	**1.1.10**	Search and retrieve relevant medicinal chemistry information from scientific journals and databases.
		1.1.11	Critically evaluate published literature on drug structures, actions, and modifications.
DOMAIN 2: PROFESSIONAL AND ETHICAL PRACTICE 2-2- COMPETENCY		**Upon completing this course, students will be able to standardize pharmaceutical materials, formulate and manufacture pharmaceutical products, and participate in systems for dispensing, storage, and distribution of medicines.** **This competency will be developed via the following key elements:**	
2.2.1	Isolate, design, identify, synthesize, purify, analyze, and standardize synthetic/natural pharmaceutical materials.	**2.2.1**	Identify drugs of synthetic and natural origin and describe their preparation pathways.
		2.2.2	Interpret analytical data (IR, NMR, UV, MS) used in the identification of pharmaceuticals.
		2.2.3	Discuss methods for isolation and purification of bioactive natural compounds.
2.2.2	Apply the basic requirements of quality management system in developing, manufacturing, analyzing, storing, and distributing pharmaceutical materials/ products considering various incompatibilities.	**2.2.4**	Apply quality control principles to ensure drug purity and therapeutic efficiency.
		2.2.5	Discuss chemical stability testing of pharmaceuticals during storage and handling.

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	Text	Code	Text
2.2.3	Recognize the principles of various tools and instruments and select the proper techniques for synthesis and analysis of different materials and production of pharmaceuticals.	2.2.6	Recognize the role of spectroscopic and chromatographic techniques in medicinal chemistry.
		2.2.7	Select appropriate analytical methods for the qualitative and quantitative assessment of drugs.
		2.2.8	Explain the application of instrumental techniques in purity testing and SAR studies.
2.2.4	Adopt the principles of pharmaceutical calculations, biostatistical analysis, bioinformatics, pharmacokinetics, and biopharmaceutics and their applications in new drug delivery systems, dose modification, bioequivalence studies, and pharmacy practice.	2.2.9	Apply basic pharmaceutical calculations related to drug design and molecular modification.
		2.2.10	Relate drug physicochemical properties (pKa, solubility, partition coefficient) to absorption and distribution.
		2.2.11	Discuss the influence of chemical modifications on bioavailability and pharmacokinetics.
2-3- COMPETENCY		**Upon completing this course, students will be able to handle and dispose biological and synthetic/natural pharmaceutical materials/products effectively and safely with respect to relevant laws and legislations.** **This competency will be developed via the following key elements:**	
2.3.1	Handle, identify, and dispose biologicals, synthetic/natural materials, biotechnology-based and radio-labeled products, and other materials/products used in pharmaceutical field.	2.3.1	Apply correct storage and labeling procedures for pharmaceutical chemicals.
		2.3.2	Follow proper protocols for disposal of chemical and biological wastes.
2-4- COMPETENCY		**Upon completing this course, students will be able to actively share professional decisions and proper actions to save patient's life in emergency situations including poisoning with various xenobiotics and effectively work in forensic fields.**	

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
			This competency will be developed via the following key elements:
2.4.2	Demonstrate understanding of the first aid measures needed to save patient's life.	**2.4.1**	Recognize poisoning symptoms caused by exposure to medicinal or chemical substances.
		2.4.2	Describe first aid management for drug overdoses and accidental toxic exposures.
		2.4.3	Apply knowledge of antidotes and emergency treatments in cases of drug toxicity.
		2.4.4	Demonstrate awareness of safety measures during laboratory and clinical exposure.
2-5- COMPETENCY			**Upon completing this course, students will be able to contribute to pharmaceutical research studies and clinical trials needed to authorize medicinal products.** **This competency will be developed via the following key elements:**
2.5.1	Fulfill the requirements of the regulatory framework to authorize a medicinal product including quality, safety, and efficacy requirements.	**2.5.1**	Explain the chemical quality attributes required for drug approval.
		2.5.2	Relate structural features to regulatory requirements of safety and efficacy.
		2.5.3	Identify documentation required for chemical quality control in drug registration.
2.5.3	Contribute in planning and conducting research studies using appropriate methodologies.	**2.5.4**	Formulate medicinal chemistry research questions related to drug structure and activity.
		2.5.5	Apply basic research methodologies in SAR, QSAR, and drug design.
		2.5.6	Collect and interpret experimental data to support research conclusions.
DOMAIN 3: Pharmaceutical Care 3-2- COMPETENCY			**Upon completing this course, students will be able to provide counselling and education services to patients and communities**

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
		about safe and rational use of medicines and medical devices. This competency will be developed via the following key elements:	
3.2.1	Integrate the pharmacological properties of drugs including mechanisms of action, therapeutic uses, dosage, contra-indications, adverse drug reactions and drug interactions	3.2.1	Correlate therapeutic use with drug chemical classification and structural features.
		3.2.2	Predict possible contraindications and drug–drug interactions based on structural similarities.
DOMAIN 4: Personal Practice 4-2- COMPETENCY		Upon completing this course, students will be able to effectively communicate verbally, non-verbally and in writing with individuals and communities. This competency will be developed via the following key elements:	
4.2.2	Use contemporary technologies and media to demonstrate effective presentation skills.	4.2.1	Use chemical drawing and molecular visualization software to present drug structures.
		4.2.2	Prepare PowerPoint presentations summarizing SAR and drug action.
		4.2.3	Design posters and infographics illustrating chemical and pharmacological properties of drugs.
		4.2.4	Deliver oral presentations integrating medicinal chemistry knowledge with clinical applications.

4. Teaching and Learning Methods

1- **Lectures** (√)

2- **E-learning** (√)

3- **Practical training/ laboratory** (√)

4- **Discussion** (√)

5- **Brainstorming** (√)

6- **Assignments** (√)

7- **Case study** (√)

8- **Seminars** (√)

Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/ discussion groups/ ......)	Training (Practical/ Clinical/ ......)	Self-learning (Tasks/ Assignments/ Projects/ ...)	Other (to be determined)
1	Introduction to Medicinal Chemistry	4	2	2	---	---
2	Antibiotics antibacterial agents	4	2	2	---	---
3	Antibiotics antibacterial agents	4	2	2	---	---
4	Antibiotics antibacterial agents	4	2	2	---	---
5	Synthetic antibacterial agents	4	2	2	---	---
6	Antiviral drugs	4	2	2	---	---
7	**Semester works**					
8	Antifungal drugs	4	2	2	---	---
9	Anti-TB drugs	4	2	2	---	---
10	Antiprotozoal agents	4	2	2	---	---
11	Antimalarial drugs	4	2	2	---	---
12	Autonomic nervous system (ANS)	4	2	2	---	---
13	Drugs acting on CVS	4	2	2	---	---
14	Drugs acting on CVS	2	2	**Practical exam**		
15	Drugs acting on CVS	2	2	**Practical exam**		

5. Methods of students' assessment

No.	Assessment Methods	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Periodical exam	Week 7	15 marks	15%
2	Final Practical/Clinical/… Exam	Week 14,15	20 marks	20%
3	Final Written Exam	Week 16,17	50 marks	50%
4	Final Oral Exam	Week 16,17	10 marks	10%
5	Assignments / Project /Portfolio/ Logbook	All semester long	5 marks	5%
	Total		100	100%

6. Learning Resources and Supportive Facilities

Learning resources (books, scientific references, etc.)	The main (essential) reference for the course	Notes on Medicinal chemistry prepared and distributed by Dept. of Pharmaceutical Chemistry. Lab Manual of Medicinal Chemistry prepared and distributed by Dept. of Pharmaceutical Chemistry.
	Other References	Wilson and Gisvold's " Textbook of Organic and Pharmaceutical Chemistry", 12th Ed., Jaime N. Delgado, J.B. Lippincot Co., 2010. William O Foye, " Principle of Medicinal Chemistry" 8th edition (2019), Williams & Wilkins, London
	Electronic Sources	https://www.ekb.eg/ar/home http://www.sciencedirect.com/ https://pubmed.ncbi.nlm.nih.gov/
	Learning Platforms	https://lms3.kfs.edu.eg/pharm/login/index.php
	Other	
Supportive facilities & equipment for teaching and learning	Devices/Instruments	- Data show, Computers, Library, Internet.
	Supplies	Classrooms.

Course Plan
Matrix of course learning outcomes CLOs – Teaching and Learning Strategy and Student Assessment

Course title: Medicinal Chemistry I   **Course code: PC 704**

Course Contents		Key elements	Teaching and Learning Methods	Student Assessment Methods
Week # 1	**Introduction to Medicinal Chemistry**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 1.1.10, 1.1.11, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.2.10, 2.2.11, 2.3.1, 2.3.2, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 2.5.5, 2.5.6, 3.2.1, 3.2.2, 4.2.1, 4.2.2, 4.2.3, 4.2.4.	Lectures, E-learning practical training and class activities	Written, practical and oral exams
Week # 2	**Antibiotics antibacterial agents**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 1.1.10, 1.1.11, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.2.10, 2.2.11, 2.3.1, 2.3.2, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 2.5.5, 2.5.6, 3.2.1, 3.2.2, 4.2.1, 4.2.2, 4.2.3, 4.2.4.	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
Week # 3	**Antibiotics antibacterial agents**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 1.1.10, 1.1.11, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.2.10, 2.2.11, 2.3.1, 2.3.2, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 2.5.5, 2.5.6, 3.2.1, 3.2.2, 4.2.1, 4.2.2, 4.2.3, 4.2.4.	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
Week # 4	**Antibiotics antibacterial agents**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 1.1.10, 1.1.11, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.2.10, 2.2.11, 2.3.1, 2.3.2, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 2.5.5, 2.5.6, 3.2.1, 3.2.2, 4.2.1, 4.2.2, 4.2.3, 4.2.4.	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
Week # 5	**Synthetic antibacterial agents**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 1.1.10, 1.1.11, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.2.10, 2.2.11, 2.3.1, 2.3.2, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 2.5.5, 2.5.6, 3.2.1, 3.2.2, 4.2.1, 4.2.2, 4.2.3, 4.2.4.	Lectures, E-learning, practical training and class activities	Written, practical and oral exams

		1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 1.1.10, 1.1.11, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.2.10, 2.2.11, 2.3.1, 2.3.2, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 2.5.5, 2.5.6, 3.2.1, 3.2.2, 4.2.1, 4.2.2, 4.2.3, 4.2.4.	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
Week # 6	**Antiviral drugs**			
Week # 7	**Semester works**			
Week # 8	**Antifungal drugs**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 1.1.10, 1.1.11, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.2.10, 2.2.11, 2.3.1, 2.3.2, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 2.5.5, 2.5.6, 3.2.1, 3.2.2, 4.2.1, 4.2.2, 4.2.3, 4.2.4.	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
Week # 9	**Anti-TB drugs**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 1.1.10, 1.1.11, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.2.10, 2.2.11, 2.3.1, 2.3.2, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 2.5.5, 2.5.6, 3.2.1, 3.2.2, 4.2.1, 4.2.2, 4.2.3, 4.2.4.	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
Week # 10	**Antiprotozoal agents**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 1.1.10, 1.1.11, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.2.10, 2.2.11, 2.3.1, 2.3.2, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 2.5.5, 2.5.6, 3.2.1, 3.2.2, 4.2.1, 4.2.2, 4.2.3, 4.2.4.	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
Week # 11	**Antimalarial drugs**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 1.1.10, 1.1.11, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.2.10, 2.2.11, 2.3.1, 2.3.2, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 2.5.5, 2.5.6, 3.2.1, 3.2.2, 4.2.1, 4.2.2, 4.2.3, 4.2.4.	Lectures, E-learning, practical training, seminars and class activities	Written, practical and oral exams
Week # 12	**Autonomic nervous system (ANS)**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 1.1.10, 1.1.11, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.2.10, 2.2.11, 2.3.1, 2.3.2, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 2.5.5, 2.5.6, 3.2.1, 3.2.2, 4.2.1, 4.2.2, 4.2.3, 4.2.4.	Lectures, E-learning, seminars and practical training	Written, practical and oral exams

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Week # 13	**Drugs acting on CVS**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 1.1.10, 1.1.11, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.2.10, 2.2.11, 2.3.1, 2.3.2, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 2.5.5, 2.5.6, 3.2.1, 3.2.2, 4.2.1, 4.2.2, 4.2.3, 4.2.4.	Lectures and E-learning	Written, practical and oral exams
Week # 14	**Drugs acting on CVS**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 1.1.10, 1.1.11, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.2.10, 2.2.11, 2.3.1, 2.3.2, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 2.5.5, 2.5.6, 3.2.1, 3.2.2, 4.2.1, 4.2.2, 4.2.3, 4.2.4.	Lectures and E-learning	Written and oral exams
Week # 15	**Drugs acting on CVS**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 1.1.10, 1.1.11, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.2.10, 2.2.11, 2.3.1, 2.3.2, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 2.5.5, 2.5.6, 3.2.1, 3.2.2, 4.2.1, 4.2.2, 4.2.3, 4.2.4.	Lectures and E-learning	Written and oral exams

**Name and Signature
Course Coordinator**

Associate. Prof. Rofida Salem

**Name and Signature
Program Coordinator**

Associate. Prof. Ahmed Amin
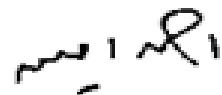
Course Specification
2025

Basic Information

Course Title (according to the bylaw)	Drug Information
Course Code (according to the bylaw)	PO 705
Department/s participating in delivery of the course	Pharmacology & Toxicology

Number of credit hours/points of the course (according to the bylaw)	Theoretical	Practical	Other (specify)	Total
	1	1		2

Course Type	Compulsory
Academic level at which the course is taught	Fourth Level
Academic Program	Bachelor of clinical Pharmacy (Pharm D Clinical)
Faculty/Institute	Faculty of Pharmacy
University/Academy	Kafrelsheikh University
Name of Course Coordinator	Prof. Dr. Sherin zakaria
Course Specification Approval Date	9/2025

Course Specification Approval	Department of Pharmacology and Toxicology Council

1. Course Overview (Brief summary of scientific content)

This course includes an advanced application of the science of drug information in terms of: its practice within the drug information centers and various clinical sites The course will focus on Drug information and poison information centers, different drug information resources, use of the internet for drug and research information, evaluating information on the web. The classification of study design and clinical trials, data presentation, and basic statistical concepts are detailed. Basics of pharmacoeconomic literature are described.

2. Course Learning Outcomes CLOs

Matrix of course learning outcomes CLOs with program outcomes POs (NARS/ARS)

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able	
Code	Text	Code	Text
Domain 1 (FUNDAMENTAL KNOWLEDGE) 1-1-COMPETENCY			Integrate knowledge from basic and clinical sciences to retrieve, appraise, synthesize and apply drug information for evidence-based, patient-centred recommendations. This competency will be developed via the following key elements:
1.1.1	Demonstrate understanding of knowledge of pharmaceutical, biomedical, social, behavioral, administrative, and clinical sciences.	1.1.1	Demonstrate a comprehensive understanding of pharmaceutical, biomedical, social, behavioral, administrative and clinical sciences necessary to formulate, investigate and interpret drug information
		1.1.2	Classify primary, secondary and tertiary drug information resources (e.g., original research, systematic reviews, monographs, formularies, online databases) and explain the appropriate

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able	
Code	**Text**	**Code**	**Text**
			contexts, strengths and limitations of each resource when answering clinical and research questions.
		1.1.3	Apply relevant principles of pharmacokinetics, pharmacodynamics and pharmaceutics to interpret evidence about drug efficacy, dosing, interactions and routes of administration when preparing drug information responses.
1.1.3	Integrate knowledge from fundamental sciences to handle, identify, extract, design, prepare, analyze, and assure quality of synthetic/natural pharmaceutical materials/products	**1.1.4**	Critically evaluate clinical trial reports, regulatory documents and product monographs to determine the appropriateness, safety and effectiveness of therapeutic options for individual patients or populations.
		1.1.5	Retrieve, organize and integrate scientific and clinical data to resolve therapeutic problems and produce concise, evidence-based recommendations.
1.1.4	Articulate knowledge from fundamental sciences to explain drugs' actions and evaluate their appropriateness, effectiveness, and safety in individuals and populations .	**1.1.6** Use scientific literature search strategies and digital tools (e.g., PubMed, clinical trial registries, specialized drug databases) to collect, appraise and summarize high-quality evidence in response to drug information questions	
1.1.5	Retrieve information from fundamental sciences to solve therapeutic problems	**1.1.7**	Identify emerging issues in drug safety, new therapeutic trends, and novel information resources that impact pharmacy practice and patient care
		1.1.8	Apply medical terminology, standard abbreviations, and professional language accurately in preparing and communicating

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able	
Code	**Text**	**Code**	**Text**
			drug information.
1.1.6	Utilize scientific literature and collect and interpret information to enhance professional decisions	**1.1.9**	Demonstrate the ability to structure and organize drug information queries using systematic approaches.
		1.1.10	Critically appraise clinical trial designs, methodology, and outcomes to determine their relevance to drug information practice.
1.1.7	Identify and critically analyze newly emerging issues influencing pharmaceutical industry and patient health care	**1.1.11**	Demonstrate adaptability in updating and modifying drug information content in response to new evidence or policy changes.
		1.1.12	Identify and address newly emerging public health concerns and medication safety issues using current information sources.
DOMAIN 2: PROFESSIONAL AND ETHICAL PRACTICE 2-1- COMPETENCY		**Work collaboratively as part of the healthcare team to deliver accurate, ethical, and patient-centered drug information, respecting legal requirements and patient rights.** **This competency will be developed via the following key elements:**	
2.1.1	Perform responsibilities and authorities in compliance with the legal and professional structure and role of all members of the health care professional Team	**2.1.1**	Perform professional responsibilities in providing drug information according to legal and institutional standards
		2.1.2	Apply ethical principles and respect patient confidentiality when handling drug information requests.
2.1.2	Adopt ethics of health care and pharmacy profession respecting patients'	**2.1.3**	Recognize personal limitations in expertise and appropriately refer or consult other professionals when necessary.

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able	
Code	Text	Code	Text
	rights and valuing people diversity.	2.1.4	Communicate drug information effectively to all members of the healthcare team to optimize patient care.
2.1.3	Recognize your own personal and professional limitations and accept the conditions of referral to or guidance from other members of the health care team	2.1.5	Collaborate with other professionals to verify and validate drug information before dissemination.
		2.1.6	Maintain professional integrity and accountability in all drug information activities
2-4- COMPETENCY		**Actively share professional decisions and proper actions to save patient's life in emergency situations including poisoning with various xenobiotics and effectively work in forensic fields** **This competency will be developed via the following key elements:**	
2.4.2	Demonstrate understanding of the first aid measures needed to save patient's life	2.4.1	Identify and describe critical scenarios such as poisoning or severe adverse reactions requiring urgent drug information.
		2.4.2	Provide accurate, evidence-based first aid and immediate management recommendations.
2.4.3	Take actions to solve any identified medicine-related and pharmaceutical care problems	2.4.3	Take prompt actions to resolve medicine-related problems identified during drug information provision
		2.4.4	Use reliable sources to assess toxicity profiles and guide management of drug-related toxicities.

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able	
Code	**Text**	**Code**	**Text**
2.4.4	Assess toxicity profiles of different xenobiotics and detect poisons in biological specimens	**2.4.5**	Participate in the evaluation of poisoning cases for educational and preventive purposes
		2.4.6	Support healthcare teams in the interpretation of toxicological data and laboratory results.
2-5- COMPETENCY		**Contribute to research and evidence evaluation processes that inform safe and effective medication use.** **This competency will be developed via the following key elements**	
2.5.1	Fulfill the requirements of the regulatory framework to authorize a medicinal product including quality, safety, and efficacy requirements.	**2.5.1**	Use regulatory guidelines and product labeling as part of drug information analysis
		2.5.2	Retrieve, interpret, and critically appraise clinical and scientific evidence to support therapeutic recommendations
2.5.2	Retrieve, interpret, and critically evaluate evidence-based information needed in pharmacy profession	**2.5.3**	Contribute to planning and conducting research activities that enhance drug information resources and practice.
2-6- COMPETENCY		**Incorporate pharmacoeconomic considerations into drug information services to improve resource allocation and patient outcomes.** **This competency will be developed via the following key elements:**	
2.6.2	Utilize the principles of drug promotion, sales, marketing, accounting, and pharmacoeconomic analysis	**2.6.1**	Apply resource management principles when organizing drug information services.
		2.6.2	Use pharmacoeconomic data to compare treatment options and support cost-effective clinical decision-making.

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able	
Code	Text	Code	Text
Domain 3: Pharmaceutical Care **3-2- Competency**		**Provide patient education, counseling, and safety information using validated drug information to ensure safe and rational medicine use.** **This competency will be developed via the following key elements:**	
3.2.1	integrate the pharmacological properties of drugs including mechanisms of action, therapeutic uses, dosage, contra-indications, adverse drug reactions and drug interactions	**3.2.1**	Integrate pharmacological properties, therapeutic uses, dosage, contraindications, adverse effects, and interactions into drug information responses
		3.2.2	Apply principles of clinical pharmacology and pharmacovigilance when delivering drug information
3.2.2	Apply the principles of clinical pharmacology and pharmacovigilance for the rational use of medicines and medical devices	**3.2.3**	Provide clear guidance on the safe use of complementary and alternative medicines
		3.2.4	Communicate toxicological profiles of drugs and xenobiotics to patients and healthcare professionals
3.2.3	Provide evidence-based information about safe use of complementary medicine including phytotherapy, aromatherapy, and nutraceuticals	**3.2.5**	Educate and counsel patients, healthcare providers, and communities about proper medicine use
		3.2.6	Promote awareness of the dangers of drug misuse, abuse, and self-medication.
3.2.4	Provide information about toxic profiles of drugs and other xenobiotics including sources, identification, symptoms, and management control.	**3.2.7**	Design and deliver public health awareness campaigns addressing medication safety, rational drug use, and prevention of misuse.
		3.2.8	Develop patient information leaflets and educational materials in clear, accessible language tailored to different literacy levels

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able	
Code	**Text**	**Code**	**Text**
3.2.5	Educate and counsel patients, other health care professionals, and communities about safe and proper use of medicines including OTC preparations and medical devices	**3.2.9**	Collaborate with community organizations, schools, and media to disseminate accurate drug information to the public
		3.2.10	Train other healthcare providers on accessing, interpreting, and applying drug information resources in their practice
3.2.6	Maintain public awareness on social health hazards of drug misuse and abuse.	**3.2.11**	Evaluate the effectiveness of patient education and public health interventions related to drug information and adjust strategies for better outcomes.
Domain 4: Personal Practice **4-1- Competency**		**Demonstrate leadership, teamwork, and problem-solving skills in the delivery of drug information services.** **This competency will be developed via the following key elements:**	
4.1.1	Demonstrate responsibility for team performance and peer evaluation of other team members, and express time management skills	**4.1.1**	Take responsibility for team performance and ensure effective time management.
4.1.2	Retrieve and critically analyze information, identify and solve problems, and work autonomously and effectively in a team.	**4.1.2**	Retrieve, critically analyze, and apply drug information to solve complex clinical problems
		4.1.3	Demonstrate creativity in designing and improving drug information tools
		4.1.4	Apply innovative approaches to enhance the accessibility and usability of drug information.
4-2- Competency		**Communicate drug information effectively across diverse settings and audiences.** **This competency will be developed via the following**	

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able	
Code	**Text**	**Code**	**Text**
		key elements:	
4.2.1	Demonstrate effective communication skills verbally, non-verbally, and in writing with professional health care teams, patients, and communities.	**4.2.1**	Demonstrate effective verbal, non-verbal, and written communication with healthcare teams and patients
4.2.2	Use contemporary technologies and media to demonipstrate effective presentation skills	**4.2.2**	Use technology and media tools to create and deliver professional presentations
		4.2.3	Employ decision-support systems to improve the quality and accuracy of drug information delivery.
4-3- Competency		**Engage in self-assessment and continuous professional development to sustain excellence in drug information practice.** **This competency will be developed via the following key elements:**	
4.3.1	Perform self-assessment to enhance professional and personal competencies.	**4.3.1**	Engage in independent learning to maintain up-to-date knowledge and skills
		4.3.2	Participate in professional development programs focused on drug information and evidence-based practice.
4.3.2	Practice independent learning needed for continuous professional development	**4.3.4**	Apply reflective practice to improve decision-making in drug information cases
		4.3.5	Contribute to research and quality improvement initiatives in drug information services
		4.3.6	Demonstrate commitment to lifelong learning

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able	
Code	Text	Code	Text
			in drug information science.

3. Teaching and Learning Methods

1. Lectures
2. E-learning
3. Practical
4. Assignment
5. Presentation
6. Case study

Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups/ ......)	Training (Practical/Clinical/ ......)	Self-learning (Tasks/ Assignments/ Projects/ ...)	Other (to be determined)
1	Introduction to the drug information and DIC centers	2	1	1		
2	Drug Information Resources	2	1	1		
3	Drug Information Resources (con.)	2	1	1		
4	Electronic source of drug Information	2	1	1		
5	Clinical trials	2	1	1		
6	Professional writing	2	1	1		
7	**Semester work**					
8	Drug formulary and monographs	2	1	1		
9	Drug formulary and monographs (con.)	2	1	1		
10	Systematic Approach to Answering Questions	2	1	1		
11	Patient information and counselling	2	1	1		
12	Patient information and counselling (con.)	2	1	1		
13	DIC administration and Pharmacovigilance	2	1	1		
14	DIC administration and	2	1	1		

	Pharmacovigilance (con.)					
15	**Revision**	**1**	**1**	Practical exam		

2. Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Formative exam	4	5	5%
2	Periodical exam	7	10	10%
3	Final Practical/Clinical/… Exam	14,15	25	25%
4	Final Written Exam	16,17	50	50%
5	Final Oral Exam	16,17	10	10%

3. Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	The main (essential) reference for the course	- A Guide for Pharmacists (2021). Malone PM, Malone MJ, Witt BA, Peterson DM (Eds). McGraw-Hill Education. 7th Edition
	Other References	- **Drug Information: A Guide for Pharmacists** (2021). Malone PM, Malone MJ, Witt BA, Peterson DM (Eds). McGraw-Hill Education. 7th Edition. - **Stockley's Drug Interactions** (2023). Baxter K, Preston CL (Eds). Pharmaceutical Press. 12th Edition. - **The Clinical Practice of Drug Information** (2022). Gabay M. McGraw-Hill Education.
	Electronic Sources	- **PubMed** – https://pubmed.ncbi.nlm.nih.gov - **Micromedex** – https://www.micromedexsolutions.com - **Drugs.com** – https://www.drugs.com - **Medscape** – https://www.medscape.com/druginfo - **Lexicomp** – https://www.lexicomp.com - **FDA (U.S. Food and Drug Administration)** –

		https://www.fda.gov/drugs - **Daily Med** – https://dailymed.nlm.nih.gov - **WHO Drug Information** – https://www.who.int/teams/health-product-and-policy-standards/standards-and-specifications/drug-information - **RxList** – https://www.rxlist.com - **MedlinePlus (U.S. National Library of Medicine)** – https://medlineplus.gov/druginformation.html
	Learning Platforms	https://lms3.kfs.edu.eg/pharm/login/index.php
	Other	
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	Data show, smart board, Unit for distance learning, Computers and Internet
	Supplies	Class rooms.
	Electronic Programs	----
	Skill Labs/ Simulators	----
	Virtual Labs	----
	Other (to be mentioned)	Library

Course Plan

Matrix of course learning outcomes CLOs – Teaching and Learning Strategy and Student Assessment

Course title: Drug Information   **Course code: PO 705**

	Course Contents	**Key Elements**	**Teaching and Learning Methods**	**Student Assessment Methods**
Week # 1	Introduction to the drug information and DIC centers	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 2.1.1, 2.1.3, 2.4.1, 2.4.2, 3.1.1, 3.1.2, 3.1.3, 4.2.1, 4.2.2, 4.2.3, 4.2.4	Lectures, E-learning, Practical, Assignment, Presentation and case study	Written, practicial and oral exams
Week # 2	drug Information Resources	1.1.6, 1.1.7, 1.1.8, 2.1.2, 2.1.4, 2.1.5, 3.1.4, 3.2.1, 3.2.2, 4.1.1, 4.1.2, 4.1.3, 4.3.1, 4.3.2	Lectures, E-learning, Practical, Assignment, Presentation and case study	Written, practicial and oral exams
Week # 3	Drug Information Resources (con.)	1.1.6, 1.1.7, 1.1.8, 2.1.2, 2.1.4, 2.1.5, 3.1.4, 3.2.1, 3.2.2, 4.1.1, 4.1.2, 4.1.3, 4.3.1, 4.3.2	Lectures, E-learning, Practical, Assignment, Presentation and case study	Written, practicial and oral exams
Week # 4	Electronic source of drug Information	1.1.12, 2.2.6, 2.2.7, 2.2.10, 2.2.16, 3.2.6, 3.2.7, 3.2.8, 4.3.4, 4.3.5, 4.3.6	Lectures, E-learning, Practical, Assignment, Presentation and case study	Written, practicial and oral exams
Week # 5	Clinical trials	1.1.10, 1.1.11, 2.5.1, 2.5.2, 2.4.1, 2.4.2, 3.1.3, 3.1.4, 3.2.9, 3.2.10, 3.2.11	Lectures, E-learning, Practical, Assignment, Presentation and case study	Written, practicial and oral exams

Week # 6	Professional writing	4.2.4, 4.1.1, 4.1.2, 4.1.3, 4.3.1, 4.3.2, 2.6.1, 2.6.2	Lectures, E-learning, Practical, Assignment, Presentation and case study	Written, practical and oral exams
Week # 7	semester work			
Week # 8	Drug formulary and monographs	1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 2.6.1, 2.6.2, 2.4.1, 2.4.2, 3.1.2, 3.1.3, 3.1.4, 4.2.1, 4.2.2, 4.2.3, 4.2.4	Lectures, E-learning, Practical, Assignment, Presentation and case study	Written, practical and oral exams
Week # 9	Drug formulary and monographs (con.)	1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 2.6.1, 2.6.2, 2.4.1, 2.4.2, 3.1.2, 3.1.3, 3.1.4, 4.2.1, 4.2.2, 4.2.3, 4.2.4	Lectures, E-learning, Practical, Assignment, Presentation and case study	Written, practical and oral exams
Week # 10	Systematic Approach to Answering Questions	1.1.9, 2.1.2, 2.1.4, 2.1.5, 2.4.1, 2.4.2, 3.1.2, 3.1.3, 3.1.4, 4.2.1, 4.2.2, 4.2.3	Lectures, E-learning, Practical, Assignment, Presentation and case study	Written, practical and oral exams
Week # 11	Patient information and counselling	3.2.1, 3.2.2, 3.2.5, 3.2.6, 3.2.7, 3.2.8, 3.2.9, 3.2.10, 3.2.11, 1.1.1, 3.1.1, 4.2.3, 4.2.4	Lectures, E-learning, Practical, Assignment, Presentation and case study	Written, practical and oral exams
Week # 12	Patient information and counselling (con.)	3.2.1, 3.2.2, 3.2.5, 3.2.6, 3.2.7, 3.2.8, 3.2.9, 3.2.10, 3.2.11, 1.1.1, 3.1.1, 4.2.3, 4.2.4	Lectures, E-learning, Practical, Assignment, Presentation and case study	Written, practical and oral exams
Week # 13	DIC administration and Pharmacovigilance	1.1.3, 1.1.5, 1.1.9, 2.2.6, 2.2.7, 2.2.10, 2.2.16, 2.4.3, 3.2.2, 3.2.5, 4.1.1, 4.1.2, 4.1.3, 4.3.1, 4.3.2	Lectures, E-learning, Practical, Assignment, Presentation and	Written, practical and oral exams

|				
				case study
Week # 14	DIC administration and Pharmacovigilance (con.)	1.1.3, 1.1.5, 1.1.9, 2.2.6, 2.2.7, 2.2.10, 2.2.16, 2.4.3, 3.2.2, 3.2.5, 4.1.1, 4.1.2, 4.1.3, 4.3.1, 4.3.2	Lectures, E-learning, Practical, Assignment, Presentation and case study	Written, practicial and oral exams
Week # 15	**Revision**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 1.1.10, 1.1.11, 1.1.12, 2.1.1, 2.1.2, 2.1.3, 2.1.4, 2.1.5, 2.1.6, 2.2.6, 2.2.7, 2.2.10, 2.2.16, 2.4.1, 2.4.2, 2.4.3, 2.5.1, 2.5.2, 2.6.1, 2.6.2, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.2.1, 3.2.2, 3.2.3, 3.2.4, 3.2.5, 3.2.6, 3.2.7, 3.2.8, 3.2.9, 3.2.10, 3.2.11, 4.1.1, 4.1.2, 4.1.3, 4.2.1, 4.2.2, 4.2.3, 4.2.4, 4.3.1, 4.3.2, 4.3.4, 4.3.5, 4.3.6	Lectures, E-learning, Practical, Assignment, Presentation and case study	Written, practicial and oral exams

Name and Signature
Course Coordinator

Name and Signature
Program Coordinator

Prof. Dr. Sherin Zakaria

Associate Prof. Dr Ahmed Amin

ا.م.د/ احمد امين
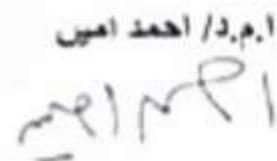
Course Specification
(2025)

1- Basic Information

Course Title (according to the bylaw)	Advanced Drug Delivery Systems
Course Code (according to the bylaw)	PT 708
Department/s participating in delivery of the course	Pharmaceutics & Pharmaceutical Technology

Number of credit hours/points of the course (according to the bylaw)	Theoretical	Practical	Other (specify)	Total
	2	0	------	2

Course Type	Compulsory
Academic level at which the course is taught	Fourth level, semester (1)
Academic Program	Bachelor of Pharmacy (PharmD, Clinical Pharmacy)
Faculty/Institute	Faculty of Pharmacy
University/Academy	Kafrelsheikh university
Name of Course Coordinator	Prof. Abdelaziz Elsayed Abdelaziz Lecturer. Aya Refat Mohammed
Course Specification Approval Date	9/2025
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department council

2- Course Overview (Brief summary of scientific content)

A continued study of pharmaceutical dosage forms with emphasis on novel and targeted drug delivery systems. Discussions focusing on transforming proteins, genes, and other biotechnology driven compounds into therapeutic products including the role of molecular modelling and new drug therapies in fabricating rational drug delivery systems are included.

The course covers targeted nanocarrier-based delivery Systems and other advanced therapy medicinal products such as gene therapy medicinal products (GTMPs), somatic cell therapy medicinal products (SCTMPs), and tissue-engineered products (TEPs). In addition to formulation aspects of biotechnology derived pharmaceuticals, it also covers the application of polymers and excipients to solve problems/issues concerning the optimization of absorption, selective transport, and targeting.

3- Course Learning Outcomes CLOs

Matrix of course learning outcomes CLOs with program outcomes POs (NARS/ARS)

<table>
<tr>
<td colspan="2">Program Outcomes (NARS/ARS)
(according to the matrix in the program specs)</td>
<td colspan="2">Course Learning Outcomes
Upon completion of the course, the student will be able to:</td>
</tr>
<tr>
<td>Code</td>
<td>Text</td>
<td>Code</td>
<td>Text</td>
</tr>
<tr>
<td colspan="2">Domain 1 (FUNDAMENTAL KNOWLEDGE)
1-1- Competency</td>
<td colspan="2">Upon completing this course, students will be able to integrate knowledge from basic and applied pharmaceutical sciences to formulate and manufacture novel drug products for better therapeutic outcomes.

This competency will be developed via the following key elements:</td>
</tr>
<tr>
<td>1.1.1</td>
<td>Demonstrate understanding of knowledge of pharmaceutical, biomedical, social, behavioural, administrative, and clinical sciences.</td>
<td>1.1.1</td>
<td>Understand the relationship between the physicochemical properties of the drug (active pharmaceutical ingredient) and the drug product and</td>
</tr>
</table>

2

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	Text	Code	Text
			the biological performance of the drug.
		1.1.2	Integrate information from different scientific resources on recent technologies that contribute to pharmaceutical industries.
		1.1.3	Demonstrate a deep understanding of the molecular properties of drugs and how they affect the choice of drug delivery system and administration route.
		1.1.4	Integrate information from different scientific resources on recent technologies used in drug targeting to various organs.
		1.1.5	Identify novel formulation principles for different routes of administration; nasal, parenteral, oral, dermal, and ocular.
		1.1.6	Identify the different types of controlled-release dosage forms.
		1.1.7	Identify the different nanotechnology-based drug delivery systems.

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
1.1.3	Integrate knowledge from fundamental sciences to handle, identify, extract, design, prepare, analyse, and assure quality of synthetic/natural pharmaceutical materials/products.	**1.1.8**	Identify method of preparation for different novel drug delivery systems among various routes of administration; nasal, parenteral, oral, dermal, and ocular.
DOMAIN 2: PROFESSIONAL AND ETHICAL PRACTICE 2-2- COMPETENCY		**Upon completing this course, students will be able to formulate and standardize different drug delivery systems to increase the performance and the quality of drug products in the treatment of specific diseases and reduce the side effects which in turn can improve the life of patients and communities.** **This competency will be developed via the following key elements:**	
2.2.2	Apply the basic requirements of quality management system in developing, manufacturing, analysing, storing, and distributing pharmaceutical materials/products considering various incompatibilities.	**2.2.1**	Design, develop, and optimize new drug delivery systems to improve the efficacy of the conventional dosage forms.
2.2.3	Recognize the principles of various tools and instruments and select the proper techniques for synthesis and analysis of different materials and production of pharmaceuticals.	**2.2.2**	Differentiate between the different techniques used to increase the absorbed drugs and its stability.
2.2.4	Adopt the principles of pharmaceutical calculations, biostatistical analysis, bioinformatics, pharmacokinetics, and biopharmaceutics and their applications in new drug delivery systems, dose	**2.2.3**	Tailor and adjust dosage regimens depending on the proposed drug delivery strategy.

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	Text	Code	Text
	modification, bioequivalence studies, and pharmacy practice		
2-3- COMPETENCY		**Upon finishing this course, students will be able to handle and dispose synthetic/natural pharmaceutical materials used in preparation of novel drug delivery systems effectively and safely with respect to relevant laws and legislations.** **This competency will be developed via the following key elements:**	
2.3.1	Handle, identify, and dispose biologicals, synthetic/natural materials, biotechnology-based and radio-labelled products, and other materials/products used in pharmaceutical fields.	2.3.1	Safely handle different chemicals to avoid their harm to the students.
2.3.2	Recognize and adopt ethical, legal, and safety guidelines for handling and disposal of biologicals, and pharmaceutical materials/products.	2.3.2	Recognize and adopt MSDS safety guidelines for safe and appropriate handling and disposal of pharmaceutical chemical materials.
2-5- COMPETENCY		**Upon completing this course, students will be able to will be able to contribute in pharmaceutical research studies and clinical trials needed to authorize medicinal products.** **This competency will be developed via the following key elements:**	
2.5.3	Contribute to planning and conducting research studies using appropriate methodologies	2.5.1	Search for new drug delivery platforms for better therapeutic outcomes.

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
		2.5.2	Develop critical thinking skills while addressing the drawbacks of conventional drug delivery systems.
Domain 4: Personal Practice **4-2- Competency**		**Upon finishing this course, students will be able to Effectively communicate verbally, non-verbally and in writing with individuals and communities.** **This competency will be developed via the following key elements:**	
4.2.2	Use contemporary technologies and media to demonstrate effective presentation skills.	**4.2.1**	Perform presentation on different drug delivery systems.
		4.2.2	Demonstrate effective presentation skills through preparing scientific seminars, delivering oral/poster presentations, and engaging in professional discussions on advanced drug delivery systems.
4-3- Competency		**Express self-awareness and be a life-long learner for continuous professional improvement.** **This competency will be developed via the following key elements:**	
4.3.1	Perform self-assessment to enhance professional and personal competencies.	**4.3.1**	Apply self-assessment strategies to improve personal effectiveness and professional performance within the scope of advanced drug delivery systems through continuous learning, critical evaluation of emerging technologies, and reflective practice.
4.3.2	Practice independent learning needed for continuous professional development.	**4.3.2**	Demonstrate independent learning skills essential for continuous

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	Text	Code	Text
			professional development in advanced drug delivery systems through critical appraisal of scientific literature, utilization of online learning resources, and participation in research-oriented activities

4- Teaching and Learning Methods

1. **Lectures** (√)
2. **E learning** (√)
3. **Brainstorming** (√)
4. **Discussion** (√)
5. **Seminars** (√)

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Theoretical teaching (lectures/ discussion groups/ ......)	Training (Practical/ Clinical/ ......)	Self-learning (Tasks/ Assignments/ Projects/ ...)	Other (to be determined)
	Course Schedule					
			Expected number of the Learning Hours			
1	Introduction	2	2	------	------	------
2	Controlled drug delivery system	2	2	------	------	------
3	Mechanism aspects of drug delivery	2	2	------	------	------
4	Targeted drug delivery systems	2	2	------	------	------
5	Colon targeted drug delivery systems	2	2	------	------	------
6	Colon targeted drug delivery systems (cont.)	2	2	------	------	------
7	Periodical exam					
8	Brain targeted drug delivery systems	2	2	------	------	------
9	Liver targeted drug delivery systems	2	2	------	------	------
10	Liver targeted drug delivery systems (cont.)	2	2	------	------	------
11	Advanced Drug Delivery Systems Using	2	2	------	------	------
12	Different Routes of Drug Administration	2	2	------	------	------
13	Advanced Drug Delivery Systems Using	2	2	------	------	------

14	Different Routes of Drug Administration (cont.)	2	2	------	------	------
15	Nanoparticle drug delivery systems (introduction and types)	2	2	------	------	------

5- Methods of students' assessment

No.	Assessment Methods	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Formative exam	4, 11	Training	----
2	Periodical exam	7	15	15%
3	Final Written Exam	16,17	75	75%
4	Final Oral Exam	16,17	10	10%
	Total		100	100%

6- Learning Resources and Supportive Facilities

Learning resources (books, scientific references, etc.)	The main (essential) reference for the course	Notes on Advanced Drug Delivery Systems prepared by the department staff.
	Other References	Mahant, S., Rao, R., & Nanda, S. (2019). *Advanced drug delivery systems: Principles and practice. New Delhi: I.K. International Publishing House* Nayak, A. K., Hasnain, M. S., Laha, B., & Maiti, S. (Eds.). (2023). *Advanced and modern approaches for drug delivery*. Amsterdam: Elsevier Academic Press.
	Electronic Sources (Links must be added)	https://www.fda.gov/ https://www.ich.org/

	Learning Platforms (Links must be added)	**https://lms3.kfs.edu.eg/pharm/login/index.php**
	Other (to be mentioned)	-----
Supportive facilities & equipment for teaching and learning	**Devices/Instruments**	Laboratory facilities (Equipment of factory).
	Supplies	Water bath, digital balances and other lab instruments
	Other (to be mentioned)	Data show, smart board, Unit for distance learning, Computers, Internet and Library.

Course Plan

Matrix of course learning outcomes CLOs – Teaching and Learning Strategy and Student Assessment

Course title: Advanced Drug Delivery Systems   **Course code: PT 708**

Week	Course Contents	ILOs	Teaching and Learning Methods	Student Assessment Methods
1	Introduction	1.1.1, 1.1.2, 1.1.3, 2.2.1, 2.2.2, 2.5.1, 2.5.2, 4.2.1	Lectures and discussion.	Written and oral exams.
2	Controlled drug delivery system	1.1.1, 1.1.2, 1.1.3, 2.2.1, 2.2.2, 2.5.1, 2.5.2, 4.2.1	Lectures and discussion.	Written and oral exams.
3	Mechanism aspects of drug delivery	1.1.1, 1.1.2, 1.1.3, 2.2.1, 2.2.2, 2.5.1, 2.5.2, 4.2.1	Lectures and discussion.	Written and oral exams.
4	Targeted drug delivery systems	1.1.1, 1.1.2, 1.1.3, 2.2.1, 2.2.2, 2.2.3, 2.5.1, 2.5.2, 4.2.1	Lectures and discussion.	Written and oral exams.
5	Colon targeted drug delivery systems	1.1.1, 1.1.2, 1.1.3, 1.1.4, 2.2.1, 2.2.2, 2.3.1, 2.3.2, 2.5.1, 2.5.2, 4.2.1	Lectures, seminars and brainstorming.	Written and oral exams.
6	Colon targeted drug delivery systems (cont.)	1.1.1, 1.1.2, 1.1.3, 1.1.4, 2.2.1, 2.2.2, 2.5.1, 2.5.2, 4.2.1	Lectures and brainstorming.	Written and oral exams.
7	Semester works			
8	Brain targeted drug delivery systems	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 2.2.1, 2.2.2, 2.5.1, 2.5.2, 4.2.1, 4.2.2.	Lectures, brain storming and discussion.	Written and oral exams.
9	Liver targeted drug delivery systems	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 2.2.1, 2.2.2, 2.5.1, 2.5.2, 4.2.1	Lectures and discussion.	Written and oral exams.
10	Liver targeted drug delivery systems (cont.)	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 2.2.1, 2.2.2, 2.5.1, 2.5.2, 4.2.1	Lectures and discussion.	Written and oral exams.

11	Advanced Drug Delivery Systems Using different Routes of Drug Administration	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 2.2.1, 2.2.2, 2.5.1, 2.5.2, 4.2.1	Lectures and discussion.	Written and oral exams.
12	Advanced Drug Delivery Systems Using different Routes of Drug Administration (cont.)	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 2.2.1, 2.2.2, 2.5.1, 2.5.2, 4.2.1	Lectures and discussion.	Written and oral exams.
13	Nanoparticle drug delivery systems (introduction and types)	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 2.2.1, 2.2.2, 2.5.1, 2.5.2, 4.2.1	Lectures and discussion.	Written and oral exams.
14	Nanoparticle drug delivery systems (preparation, characterization)	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 2.2.1, 2.2.2, 2.5.1, 2.5.2, 4.2.1, 4.3.1, 4.3.2	Lectures and discussion.	Written and oral exams.
15	Nanoparticle drug delivery systems (application)	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 2.2.1, 2.2.2, 2.5.1, 2.5.2, 4.2.1, 4.3.1, 4.3.2	Lectures and discussion.	Written and oral exams.

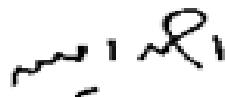**Name and Signature**
Course Coordinator
Prof. Abdelaziz Elsayed Abdelaziz
Lecturer. Aya Refat Mohammed

Name and Signature
Program Coordinator

Ass. Prof. Ahmed Amin Ali

Course Specification
(2025)

1. Basic Information

Course Title (according to the bylaw)	Biopharmaceutics and Pharmacokinetics
Course Code (according to the bylaw)	PT 707
Department/s participating in delivery of the course	Pharmaceutics and Pharmaceutical Technology

Number of credit hours/points of the course (according to the bylaw)	Theoretical	Practical	Other (specify)	Total
	2	1	----	3

Course Type	Compulsory
Academic level at which the course is taught	Fourth Level, Semester (1)
Academic Program	Bachelor of Pharmacy (PharmD, Clinical Pharmacy)
Faculty/Institute	Faculty of Pharmacy
University/Academy	Kafrelsheikh University
Name of Course Coordinator	Ass. Prof. Eman Mazyad Lecturer. Ahmed Adel
Course Specification Approval Date	9/2025
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council

2. Course Overview (Brief summary of scientific content)

This course covers the relationship between the physicochemical properties of the drug (active pharmaceutical ingredient), the drug product and the biological performance of the drug, the principles of biopharmaceutics and its strategies for enhancing drug delivery and bioavailability, Biopharmaceutics Classification System (BCS) and its importance as a regulatory tool for biowaiver and modern drug development, principles of pharmacokinetics (absorption, distribution, metabolism, and elimination), concepts of clinical trials, bioequivalence, biowaivers, in vitro-in vivo correlations (IVIVCs).

3. Course Learning Outcomes CLOs

Matrix of course learning outcomes CLOs with program outcomes POs (NARS/ARS)

<table>
<tr>
<td colspan="2">Program Outcomes (NARS/ARS)
(according to the matrix in the program specs)</td>
<td colspan="2">Course Learning Outcomes
Upon completion of the course, the student will be able to:</td>
</tr>
<tr>
<td>Code</td>
<td>Text</td>
<td>Code</td>
<td>Text</td>
</tr>
<tr>
<td colspan="2">DOMAIN 1: FUNDAMENTAL KNOWLEDGE

1-1-COMPETENCY</td>
<td colspan="2">Upon finishing this course, students will be able to integrate knowledge from basic and applied pharmaceutical and clinical sciences to identify the principle of biopharmaceutics and pharmacokinetics.
This competency will be developed through the following key elements:</td>
</tr>
<tr>
<td rowspan="3">1-1-1-</td>
<td rowspan="3">Demonstrate understanding of knowledge of pharmaceutical, biomedical, social, behavioral, administrative, and clinical sciences.</td>
<td>1.1.1.</td>
<td>Recognize the relationship between the physicochemical properties of the drug (active pharmaceutical ingredient) and the drug product and the biological performance of the drug.</td>
</tr>
<tr>
<td>1.1.2.</td>
<td>Learn the principles of biopharmaceutics and its strategies for enhancing drug delivery and bioavailability.</td>
</tr>
<tr>
<td>1.1.3.</td>
<td>Identify the Biopharmaceutical Classification System (BCS) and its importance as a regulatory tool for biowaiver and modern drug development.</td>
</tr>
</table>

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
1-1-6-	**Utilize scientific literature and collect and interpret information to enhance professional decision.**	**1.1.4.**	Understand the principles of pharmacokinetics (absorption, distribution, metabolism, and elimination).
		1.1.5.	Know the concepts of clinical trials, bioequivalence, biowaivers and in vitro-in vivo correlations (IVIVC's).
		1.1.6.	Understand the linear pharmacokinetics following IV and oral drug administration (one compartment model).
DOMAIN 2: PROFESSIONAL AND ETHICAL PRACTICE **2-2- COMPETENCY**		**Upon finishing this course, students will be able to apply biopharmaceutics and pharmacokinetic principles in pharmaceutical product development.** **This competency will be developed via the following key elements:**	
2-2-4-	**Adopt the principles of pharmaceutical calculations, biostatistical analysis, bioinformatics, pharmacokinetics, and biopharmaceutics and their applications in new drug delivery systems, dose modification, bioequivalence studies, and pharmacy practice.**	**2.2.1.**	Describe the impact of pharmacokinetics and biopharmaceutics on the design of new drug delivery systems, dose adjustment, and bioequivalence studies.
		2.2.2.	Apply pharmacokinetic models and equations to calculate important parameters for dose optimization.
		2.2.3.	Analyze case studies and experimental data to evaluate drug bioavailability and bioequivalence

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	Text	Code	Text
Domain 4: PERSONAL PRACTICE **4-2- COMPETENCY**		**Upon finishing this course, students will be able to effectively communicate verbally, non-verbally and in writing with individuals and communities.** **This competency will be developed via the following key elements:**	
4-2-2-	**Use contemporary technologies and media to demonstrate effective presentation skills.**	**4.2.1.**	Demonstrate the ability to simplify and communicate complex pharmacokinetic and biopharmaceutic concepts through engaging and well-structured presentations
		4.2.2.	Use contemporary technologies (e.g., interactive slides, multimedia, real-time feedback tools) to deliver effective presentations in biopharmaceutics and pharmacokinetics.
		4.2.3.	Work effectively both independently and within a team in solving pharmacokinetic and biopharmaceutic problems.
4-3- COMPETENCY		**Express self-awareness and be a lifelong learner for continuous professional improvement.** **This competency will be developed via the following key elements:**	
4-3-2	**Practice independent learning needed for continuous professional development.**	**4.3.1**	Practice independent learning strategies (e.g., literature review, online resources, scientific databases) to solve problems related to pharmacokinetics and biopharmaceutics.
		4.3.2	Apply self-directed learning in analyzing new trends in drug delivery, dose modification, and bioequivalence studies.

4. Teaching and Learning Methods

1. Lectures   (√)
2. Practical training   (√)

4

3. Seminar / Workshop   (√)

4. E-learning   (√)

5. Brainstorming   (√)

6. Case Study   (√)

7. Presentation   (√)

8. Discussion , Assignment   (√)

Course Schedule						
Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/ discussion groups/ ......)	**Training (Practical/ Clinical/ ......)**	**Self-learning (Tasks/ Assignments/ Projects/ ...)**	**Other (to be determined)**
1	Introduction	4	2	2	------	------
2	Oral Drug Absorption	4	2	2	------	------
3	Factors affecting oral Drug Absorption	4	2	2	------	------
4	Drug Dissolution	4	2	2	------	------
5	Biopharmaceutics Classification System	4	2	2	------	------
6	Bioequivalence, Biowaivers, and In vitro-In vivo Correlations	4	2	2	------	------
7	Periodical exam					
8	Bioequivalence, Biowaivers, and In vitro-In vivo Correlations (Continue)	4	2	2	------	------
9	Drug Distribution	4	2	2	------	------
10	Drug Metabolism	4	2	2	------	------
11	Drug Excretion	4	2	2	------	------
12	Pharmacokinetics following IV bolus administration.	4	2	2	------	------
13	Pharmacokinetics following multiple IV administration and IV infusion.	4	2	2	------	------
14	Pharmacokinetics following single oral administration.	2	2	Practical exam	------	------
15	Pharmacokinetics following multiple oral administration	2	2	Practical exam	------	------

5. Methods of students' assessment

No.	Assessment Methods	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Periodical exam	7	15	15 %
2	Final Practical Exam	14.15	25	25 %
3	Final Written Exam	16.17	50	50 %
4	Final Oral Exam	16.17	10	10 %
	Total	-----	100	100 %

6. Learning Resources and Supportive Facilities

Learning resources (books, scientific references, etc.)	The main (essential) reference for the course	Rakesh Kumar Tekade, Biopharmaceutics and Pharmacokinetics Considerations, Volume 1, 2021.
	Other References	Notes on Biopharmaceutics & Pharmacokinetics prepared by the department staff.
	Electronic Sources (Links must be added)	http://www.FDA.gov https://www.ich.org
	Learning Platforms (Links must be added)	https://lms3.kfs.edu.eg/pharm/login/index.php
	Other (to be mentioned)	--------------------

Supportive facilities & equipment for teaching and learning	Devices/Instruments	- Data show - Computers - Library - Internet - Distant learning unit - Smart board
	Supplies	Classrooms
	Electronic Programs	----------------
	Skill Labs/ Simulators	----------------
	Virtual Labs	----------------
	Other (to be mentioned)	----------------

Course Plan

Matrix of course learning outcomes CLOs – Teaching and Learning Strategy and Student Assessment

Course title: Biopharmaceutics & Pharmacokinetics   **Course code:** PT 707

Week	Course Contents	Key elements	Teaching and Learning Methods	Student Assessment Methods
1	Introduction	1.1.1, 1.1.2	Lectures, Discussion, practical training and class activities	Written and oral exams
2	Oral Drug Absorption	1.1.1, 1.1.2, 1.1.4, 2.2.1, 2.2.2, 4.2.1	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
3	Factors affecting oral Drug Absorption	1.1.1, 1.1.2, 2.2.1, 2.2.2	Lectures, Brainstorming, practical training and class activities	Written, practical and oral exams
4	Drug Dissolution	1.1.1, 1.1.2, 2.2.1, 2.2.2, 4.2.1	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
5	Biopharmaceutics Classification System	1.1.3, 2.2.1, 2.2.2	Lectures, Presentation, practical training and class activities	Written, practical and oral exams
6	Bioequivalence, Biowaivers, and In vitro-In vivo Correlations	1.1.5, 2.2.1, 2.2.2, 4.2.2	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
7	Periodical exam			
8	Bioequivalence, Biowaivers, and In vitro-In vivo Correlations (Continue)	1.1.5, 2.2.1, 2.2.2, 4.3.1.	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
9	Drug Distribution	1.1.4, 2.2.1, 2.2.2, 4.2.3.	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
10	Drug Metabolism	1.1.4, 2.2.1, 2.2.2, 2.2.3, 4.3.1, 4.3.2.	Lectures, Presentation, practical training and class activities	Written, practical and oral exams

11	Drug Excretion	1.1.4, 2.2.1, 2.2.2, 2.2.3, 4.3.1, 4.3.2.	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
12	Pharmacokinetics following IV bolus administration.	1.1.6, 4.2.1, 4.2.2	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
13	Pharmacokinetics following multiple IV administration and IV infusion.	1.1.6, 4.2.1, 4.2.2, 4.2.3, 4.3.1, .4.3.2	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
14	Pharmacokinetics following single oral administration.	1.1.6, 4.2.1, 4.2.2, 4.2.3, 4.3.1, .4.3.2	Lectures and brainstorming	Written and oral exams
15	Pharmacokinetics following multiple oral administration.	1.1.6, 4.2.1, 4.2.2, 4.2.3	Lectures and discussion	Written and oral exams

Name and Signature
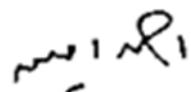**Course Coordinator**
Ass. Prof. Eman Mazyad
Lecturer. Ahmed Adel

Name and Signature
Program Coordinator
Ass. Prof. Ahmed Amin

Course Specification

(2025)

1.Basic Information

Course Title (according to the bylaw)	Medical microbiology			
Course Code (according to the bylaw)	PM 705			
Department/s participating in delivery of the course	Microbiology and immunology department			
Number of credit hours/points of the course (according to the bylaw)	Theoretical	Practical	Other (specify)	Total
	2	1		3
Course Type	Compulsory			
Academic level at which the course is taught	Fourth level,Semester 1			
Academic Program	Bachelor of Pharmacy (Pharm D clinical program)			
Faculty	Faculty of Pharmacy			
University	Kafrelshiekh University			
Name of Course Coordinator	DR. Nesma Maged			
Course Specification Approval Date	9/2025			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council			

2. Course Overview (Brief summary of scientific content)

The course aims to educate students about the basic features of general bacteriology, virology and mycology and to familiarize students with the common infections and diseases of medical importance, their microbial causes, as well as laboratory diagnosis, treatment, prevention and control of such diseases.

3. Course Learning Outcomes CLOs

Matrix of course learning outcomes CLOs with program outcomes POs (NARS/ARS)

<table>
<tr>
<th colspan="2">Program Outcomes (NARS/ARS)
(according to the matrix in the program specs)</th>
<th colspan="2">Course Learning Outcomes
Upon completion of the course, the student will be able to:</th>
</tr>
<tr>
<th>Code</th>
<th>Text</th>
<th>Code</th>
<th>Text</th>
</tr>
<tr>
<td colspan="2"><b style="color:red">Domain 1 (FUNDAMENTAL KNOWLEDGE)
1-1- COMPETENCY</td>
<td colspan="2">Upon finishing this course, students will be able to integrate knowledge from basic medical microbiology to understand the infectious disease in human beings.

This competency will be developed via the following key elements:</td>
</tr>
<tr>
<td rowspan="3">1.1.1</td>
<td rowspan="3">Demonstrate understanding of knowledge of pharmaceutical, biomedical, social, behavioral, administrative, and clinical sciences.</td>
<td>1.1.1</td>
<td>Demonstrate knowledge of microbial pathogenesis and pharmaceutical Treatments.</td>
</tr>
<tr>
<td>1.1.2</td>
<td>Explain social and behavioral factors affecting disease spread.</td>
</tr>
<tr>
<td>1.1.3</td>
<td>Apply principles to manage infection prevention programs.</td>
</tr>
</table>

2

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
1.1.6	Utilize scientific literature and collect and interpret information to enhance professional decisions.	1.1.4	**Utilize scientific literature to research microbial diseases**
		1.1.5	**Collect data from laboratory tests and clinical studies**
		1.1.6	**Interpret findings to improve diagnosis and treatment**
1.1.7	Identify and critically analyze newly emerging issues influencing pharmaceutical industry and patient health care.	1.1.7	**Identify emerging microbial threats affecting public health**
		1.1.8	**Evaluate challenges in treating resistant infections**
		1.1.9	**Analyze the impact of new pathogens on drug development**
DOMAIN 2: PROFESSIONAL AND ETHICAL PRACTICE 2-1- COMPETENCY		**Upon finishing this course, students will be able to work collaboratively as a member of an inter-professional health care team to improve the quality of life of individuals and communities, and respect patients' rights.** **This competency will be developed via the following key elements:**	
2.1.2	Adopt ethics of health care and pharmacy profession respecting patients'	2.1.1	**Demonstrate ethical behavior in handling microbiological specimens.**
		2.1.2	**Apply confidentiality principles when reporting patient results.**

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
	rights and valuing people diversity	**2.1.3**	**Interpret ethical guidelines related to infectious disease management**
2-4- COMPETENCY		**Upon finishing this course, students will be able to actively share professional decisions and proper actions to save patient's life in emergency situations and controlling severe symptoms.** **This competency will be developed via the following key elements:**	
2.4.2	Demonstrate understanding of the first aid measures needed to save patient's life.	**2.4.1**	**Demonstrate correct CPR techniques for a patient experiencing septic shock caused by bacterial infection**
		2.4.2	**Perform the recovery position for a meningitis patient suffering from seizures and unconsciousness**
2.4.4	Assess toxicity profiles of different xenobiotics and detect poisons in biological specimens.	**2.4.3**	**Assess the toxic effects of bacterial endotoxins in patient blood samples.**
		2.4.4	**Detect bacterial and chemical poisons in clinical specimens using advanced microbiological assays**
		2.4.5	**Identify microbial toxins, such as botulinum toxin, in biological specimens.**
		2.4.6	**Evaluate laboratory test results to determine the toxicity profile of fungal mycotoxins.**
2-5- COMPETENCY		**Upon finishing this course, students will be able to contribute in microbiological research studies and clinical trials needed to authorize antimicobial products.** **This competency will be developed via the following key elements:**	

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
2.5.2	Retrieve, interpret, and critically evaluate evidence- based information needed in pharmacy profession.	**2.5.1**	**Analyze laboratory results to identify pathogenic microorganisms in patient samples.**
		2.5.2	**Apply microbiological knowledge to select appropriate antimicrobial therapy.**
		2.5.3	**Evaluate the effectiveness of infection control measures in clinical settings.**
		2.5.4	**Demonstrate proper aseptic techniques during microbiological specimen handling**
Domain 3: Pharmaceutical Care **3-1- Competency**		**Upon finishing this course, students will be able to apply the principles of medical microbiology to participate in improving health care services using evidence-based data.** **This competency will be developed via the following key elements:**	
3.1.1	Apply the principles of body function and the basis of genomics in health and disease states to manage different diseases.	**3.1.1**	**Analyze genomic sequences of pathogens to determine virulence factors.**
		3.1.2	**Apply principles of microbial physiology to explain infection mechanisms.**
		3.1.3	**Develop strategies for managing infectious diseases based on genomics**
3.1.2		**3.1.4**	**Identify pathogenic microorganisms responsible for hospital-acquired infections.**

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	Text	Code	Text
	Apply the principles of public health and pharmaceutical microbiology to select and assess proper methods of infection control.	3.1.5	Demonstrate proper hand hygiene techniques to prevent microbial transmission.
		3.1.6	Assess the efficiency of sterilization and disinfection procedures.
3.1.3	Monitor and control microbial growth and carry out laboratory tests for identification of infections/diseases.	3.1.7	Monitor microbial growth in clinical specimens to detect potential pathogens.
		3.1.8	Control contamination in laboratory environments through aseptic techniques.
		3.1.9	Interpret laboratory results to guide appropriate antimicrobial therapy
		3.1.10	Apply biochemical and molecular tests to identify infectious agents.
3.1.4	Relate etiology, epidemiology, pathophysiology, laboratory diagnosis, and clinical features of infections/diseases and their pharmacotherapeutic approaches.	3.1.11	Analyze the etiology and epidemiology of infectious diseases.
		3.1.12	Interpret laboratory findings to confirm microbial infections.
		3.1.13	Correlate clinical manifestations with pathophysiological mechanisms.
		3.1.14	Evaluate therapeutic options for effective disease management
3-2- Competency		Upon finishing this course, students will be able to provide counseling and education services to patients and communities about safe and rational use of medicines . This competency will be developed via the following key elements:	

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	Text	Code	Text
3.2.4	Provide information about toxic profiles of drugs and other xenobiotics including sources, identification, symptoms, and management control.	3.2.1	**Analyze toxic profiles of drugs and other xenobiotics to determine sources, identification methods, symptoms, and appropriate management strategies.**
		3.2.2	**Evaluate the potential risks of drug and xenobiotic exposure, focusing on their toxic effects, early warning signs, and strategies for safe handling.**
Domain 4: Personal Practice **4-1- Competency**		**Upon finishing this course, students will be able to express leadership, time management, critical thinking, problem solving, independent and team working, creativity and entrepreneurial skills.** **This competency will be developed via the following key elements:**	
4.1.1	Demonstrate responsibility for team performance and peer evaluation of other team members, and express time management skills.	4.1.1	**Demonstrate commitment to team tasks and respect for deadlines.**
		4.1.2	**Organize time effectively to achieve project goals.**
4.1.2	Retrieve and critically analyze information, identify and solve problems, and work autonomously and effectively in a team.	4.1.3	**Retrieve information from reliable sources.**
		4.1.4	**Collaborate effectively within a team**
		4.1.5	**Identify problems related to diagnosis and treatment.**
4-2- Competency		**Upon finishing this course, students will be able to effectively communicate verbally, non-verbally and in writing with individuals and communities.** **This competency will be developed via the following key elements:**	
4.2.2	Use contemporary technologies and media to demonstrate effective	4.2.1	**Use modern media tools to design professional presentations about bacteria.**

	presentation skills.		
		4.2.2	**Demonstrate presentation about bacteria skills by explaining ideas clearly**
4-3- Competency			**Upon finishing this course, students will be able to express self-awareness and be a life-long learner for continuous professional improvement.** **This competency will be developed via the following key elements:**
4.3.1	Perform self-assessment to enhance professional and personal competencies.	4.3.1	**Implement self-assessment regularly to improve your skills.**
		4.3.2	**Perform evaluations to identify strengths and weaknesses.**

4. Teaching and Learning Methods

.1- **Lectures** **(√)**

2- **E-learning** **(√)**

3- **Practical training/ laboratory** **(√)**

4- **Class activity** **(√)**

5- **Seminars** **(√)**

6- **Case study** **(√)**

7- **Virtual lab** **(√)**

8- **Assignment** **(√)**

Course schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussio n groups/ ....)	Training (Practical/Clinical/..)	Self-learning (Tasks/ Assignments / Projects/ ...)	Other (to be determined)
1	Introduction to microbial infection	4	2	2		
2	Bacteriology- Gram positive cocci	4	2	2		
3	Gram positive cocci	4	2	2		
4	Gram positive bacilli	4	2	2		
5	Gram negative cocci	4	2	2		
6	Mycobacterium group	4	2	2		
7	**Semester works**					
8	Gram negative bacilli	4	2	2		
9	Gram negative bacilli (cont.)	4	2 / 2	2 / 2		
10	Gram negative bacilli (cont.)	4	2	2		

11	Gram negative bacilli (cont.)	4		2	2	
12	Chylamydiae &Rickettsiae	4		2	2	
13	Mycology	4	2	2	2	
14	Mycology	4		2	**Practical exam**	
15	Spirochetes	4		2	**Practical exam**	

5.Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Exam 1written (formative exam)	**Week 6**	…..	…..
2	Periodical exam	**Week 7**	**15**	**15%**
3	Final Written Exam	**Week 16-17**	**50**	**50%**
	Final PracticalExam	**Week 14-15**	**25**	**25%**
	Final Oral Exam	**Week 16-17**	**10**	**10%**
	Assignments / Portfolio/ Logbook	**Week 13-14**	….….	….….

5. Learning Resources and Supportive Facilities

Learning resources (books, scientific references, etc.) *	**The main (essential) reference for the course** (must be written in full according to the scientific documentation method)	Jwartez ,E.et al. Medical Microbiology22th ed . Appton & Lange. Murray et al ,Medical microbiology 4th ed ., 91- 92 Mahon, Connie R., and Donald C. Lehman. Textbook of Diagnostic Microbiology-E-Book: Textbook of Diagnostic Microbiology-E-Book. Elsevier Health Sciences, 2022.
	Other References	Notes and Lab manual prepared by the department staff.
	Electronic Sources (Links must be added)	www.pubmed.com
		www.sciencedirect.com
	Learning Platforms (Links must be added)	https://lms3.kfs.edu.eg/pharm/login/index.php
	Other (to be mentioned)	www.med.sc.edu www.themicrobe.com www.themicrobiologyplace.com
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	Laboratory facilities.
	Supplies	microscope, laminar flow & autoclave and other lab instruments
	Electronic Programs	----
	Skill Labs/ Simulators	----
	Virtual Labs	----
	Other (to be mentioned)	Data show, smart board, Unit for distance learning, Computers, Internet and Library.

Course Plan

matrix of course learning outcomes CLOs – teaching and Learning Strategy and Student Assessment Course title: medical microbiology   Course code: Pm 705

	Course Contents	Key elements	teaching and Learning methods	Student Assessment methods
Week # 1	**Introduction to microbial infection**	**1.1.1,1.1.2,1.1.3,1.1.4,1.1.5,1.1.6, 1.1.7, 1.1.8 ,1.1.8, 1.1.9**	**Lectures, E- Learning and Practical training**	**Written, practical and oral exams**

Week # 2	Bacteriology- Gram positive cocci	1.1.1,1.1.2,1.1.3,1.1.4,1.1.5,1.1.6, 1.1.7, 1.1.8 ,1.1.8, 1.1.9, 2.1.1, 2.1.2, 2.1.3,2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.1.5,3.1.6, 3.1.7, 3.1.8, 3.1.9, 3.1.10, 3.1.11, 3.1.12, 3.1.13, 3.1.14, 3.2.1, 3.2.2, 4.1.1, 4.1.2, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.2.1, 4.2.2, 4.3.1, 4.3.2,	Lectures, E-learning, practical training, class activity	Written, practical and oral exams
Week # 3	Gram positive cocci	1.1.1,1.1.2,1.1.3,1.1.4,1.1.5,1.1.6, 1.1.7, 1.1.8 ,1.1.8, 1.1.9, 2.1.1, 2.1.2, 2.1.3, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.1.5,3.1.6, 3.1.7, 3.1.8, 3.1.9, 3.1.10, 3.1.11, 3.1.12, 3.1.13, 3.1.14, 3.2.1, 3.2.2, 4.1.1, 4.1.2, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.2.1, 4.2.2, 4.3.1, 4.3.2,	Lectures, E- learning, practical Training,	Written, practical and oral exams
Week # 4	Gram positive bacilli	1.1.1,1.1.2,1.1.3,1.1.4,1.1.5,1.1.6, 1.1.7, 1.1.8 ,1.1.8, 1.1.9, 2.1.1, 2.1.2, 2.1.3, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.4.5, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.1.5,3.1.6, 3.1.7, 3.1.8, 3.1.9, 3.1.10, 3.1.11, 3.1.12, 3.1.13, 3.1.14, 3.2.1, 3.2.2, 4.1.1, 4.1.2, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.2.1, 4.2.2 ,4.3.1, 4.3.2	Lectures, E- learning, practical Training, class activity	Written, practical and oral exams
Week # 5	Gram negative cocci	1.1.1,1.1.2,1.1.3,1.1.4,1.1.5,1.1.6, 1.1.7, 1.1.8 ,1.1.8, 1.1.9, 2.1.1, 2.1.2, 2.1.3, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.1.5,3.1.6, 3.1.7, 3.1.8, 3.1.9, 3.1.10, 3.1.11, 3.1.12, 3.1.13, 3.1.14, 3.2.1, 3.2.2, 4.1.1, 4.1.2, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.2.1, 4.2.2, 4.3.1, 4.3.2,	Lectures, E- Learning and practical training	Written, practical and oral exams

| Week # 6	Mycobacterium group	1.1.1,1.1.2,1.1.3,1.1.4,1.1.5,1.1.6, 1.1.7, 1.1.8 ,1.1.8, 1.1.9, 2.1.1, 2.1.2, 2.1.3, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.1.5,3.1.6, 3.1.7, 3.1.8, 3.1.9, 3.1.10, 3.1.11, 3.1.12, 3.1.13, 3.1.14, 3.2.1, 3.2.2, 4.1.1, 4.1.2, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.2.1, 4.2.2, 4.3.1, 4.3.2,	Lectures, E- learning, practical training, case study	Written, practical and oral exams
Week # 7				
Week # 8	Gram negative bacilli	1.1.1,1.1.2,1.1.3,1.1.4,1.1.5,1.1.6, 1.1.7, 1.1.8 ,1.1.8, 1.1.9, 2.1.1, 2.1.2, 2.1.3, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.1.5,3.1.6, 3.1.7, 3.1.8, 3.1.9, 3.1.10, 3.1.11, 3.1.12, 3.1.13, 3.1.14, 3.2.1, 3.2.2, 4.1.1, 4.1.2, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.2.1, 4.2.2, 4.3.1, 4.3.2,	Lectures, E- learning, practical training and class activity	Written, practical and oral exams
Week # 9	Gram negative bacilli (cont.)	1.1.1,1.1.2,1.1.3,1.1.4,1.1.5,1.1.6, 1.1.7, 1.1.8 ,1.1.8, 1.1.9, 2.1.1, 2.1.2, 2.1.3, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.1.5,3.1.6, 3.1.7, 3.1.8, 3.1.9, 3.1.10, 3.1.11, 3.1.12, 3.1.13, 3.1.14, 3.2.1, 3.2.2, 4.1.1, 4.1.2, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.2.1, 4.2.2, 4.3.1, 4.3.2,	Lectures, E- learning, practical training and case study	Written, practical and oral exams

| Week # 10 | Gram negative bacilli (cont.) | 1.1.1,1.1.2,1.1.3,1.1.4,1.1.5,1.1.6, 1.1.7, 1.1.8 ,1.1.8, 1.1.9, 2.1.1, 2.1.2, 2.1.3, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 3.1.1, 3.1.2, 3.1.3, 3.1.4,3.1.5,3.1.6, 3.1.7, 3.1.8, 3.1.9, 3.1.10, 3.1.11, 3.1.12, 3.1.13, 3.1.14, 3.2.1, 3.2.2, 4.1.1, 4.1.2, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.2.1, 4.2.2, 4.3.1, 4.3.2, | Lectures, E- Learning and practical training | Written, practical and oral exams |

Week # 11	**Gram negative bacilli (cont.)**	**1.1.1,1.1.2,1.1.3,1.1.4,1.1.5,1.1. 6, 1.1.7, 1.1.8 ,1.1.8, 1.1.9, 2.1.1, 2.1.2, 2.1.3, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 3.1.1, 3.1.2, 3.1.3, 3.1.4,3.1.5,3.1.6, 3.1.7, 3.1.8, 3.1.9, 3.1.10, 3.1.11, 3.1.12, 3.1.13, 3.1.14, 3.2.1, 3.2.2, 4.1.1, 4.1.2, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.2.1, 4.2.2, 4.3.1, 4.3.2,**	**Lectures, E- learning, practical training, seminars and case study**	**Written, practical and oral exams**
Week # 12	**Chylamydiae &Rickettsiae**	**1.1.1,1.1.2,1.1.3,1.1.4,1.1.5,1.1. 6, 1.1.7, 1.1.8 ,1.1.8, 1.1.9, 2.1.1, 2.1.2, 2.1.3, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.1.5,3.1.6, 3.1.7, 3.1.8, 3.1.9, 3.1.10, 3.1.11, 3.1.12, 3.1.13, 3.1.14, 3.2.1, 3.2.2, 4.1.1, 4.1.2, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.2.1, 4.2.2, 4.3.1, 4.3.2,**	**Lectures, E-learning Practical Training and class activity**	**Written, practical and oral exams**
Week # 13	**Mycology**	**1.1.1,1.1.2,1.1.3,1.1.4,1.1.5,1.1. 6, 1.1.7, 1.1.8 ,1.1.8, 1.1.9, 2.1.1, 2.1.2, 2.1.3, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.4.6, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.1.5,3.1.6, 3.1.7, 3.1.8, 3.1.9, 3.1.10, 3.1.11, 3.1.12, 3.1.13, 3.1.14, 3.2.1, 3.2.2, 4.1.1, 4.1.2, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.2.1, 4.2.2, 4.3.1, 4.3.2,**	**Lecture, E- learning practical training , virtual lab and assignment**	**Written, practical and oral exams**
Week # 14	**Mycology**	**1.1.1,1.1.2,1.1.3,1.1.4,1.1.5,1.1. 6, 1.1.7, 1.1.8 ,1.1.8, 1.1.9, 2.1.1, 2.1.2, 2.1.3,2.4.1, 2.4.2, 2.4.3, 2.4.6, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 3.1.1, 3.1.2, 3.1.3, 3.1.4,3.1.5,3.1.6, 3.1.7, 3.1.8, 3.1.9, 3.1.10, 3.1.11, 3.1.12, 3.1.13, 3.1.14, 3.2.1, 3.2.2, 4.1.1, 4.1.2, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.2.1, 4.2.2, 4.3.1, 4.3.2**	**Lectures , E- learning, virtual lab and assignment**	**Written and oral exams**

|	Spirochetes	1.1.1,1.1.2,1.1.3,1.1.4,1.1.5,1.1.6, 1.1.7, 1.1.8 ,1.1.8, 1.1.9, 2.1.1, 2.1.2, 2.1.3, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.1.5,3.1.6, 3.1.7, 3.1.8, 3.1.9, 3.1.10, 3.1.11, 3.1.12, 3.1.13, 3.1.14, 3.2.1, 3.2.2, 4.1.1, 4.1.2, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.2.1, 4.2.2, 4.3.1, 4.3.2,	Lectures , E- learning and seminars	Written and oral exams
Week # 15				

Name and Signature
Course Coordinator

Dr. Nesma Elkemary
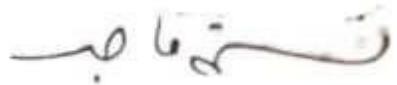
Name and Signature
Program Coordinator

Assistant prof. Ahmed Amin
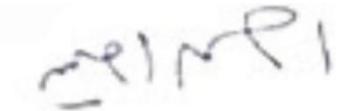
Course Specification

(2025)

1. Basic Information

Course Title (according to the bylaw)	Quality control of pharmaceuticals
Course Code (according to the bylaw)	PA 704
Department/s participating in delivery of the course	Pharmaceutical Analytical Chemistry

Number of credit hours/points of the course (according to the bylaw)	Theoretical	Practical	Other (specify)	Total
	2	1	-	3

Course Type	Compulsory
Academic level at which the course is taught	Level (4)
Academic Program	Bachelor in pharmacy (Pharm D Clinical)
Faculty/Institute	Faculty of Pharmacy
University/Academy	Kafrelsheikh University
Name of Course Coordinator	Prof. Dr. Fathalla Belal
Course Specification Approval Date	9/2025
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department council

2. Course Overview (Brief summary of scientific content)

This course covers quality control and quality assurance of pharmaceuticals, good analytical practice and sampling (Introduction, sampling of pharmaceuticals and related materials, type of sampling tools, sampling plans), documentation, validation of analytical methods according to ICH guidelines Q2 R1, atomic spectroscopy, drug stability, stability studies and stability indicating methods, and official methods of analysis applied to raw materials and end products.

3. Course Learning Outcomes CLOs

Matrix of course learning outcomes CLOs with program outcomes POs (NARS/ARS)

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
DOMAIN 1- FUNDAMENTAL KNOWLEDGE **1.1. Competency**		**Graduates will be able to integrate knowledge from basic analytical techniques to identify as well as quantify different active pharmaceutical ingredients either authentic or in different pharmaceutical formulations in addition to biological samples.** **This competency will be developed via the following key elements:**	
1.1.1	Demonstrate understanding of knowledge of pharmaceutical, biomedical, social, behavioral, administrative, and clinical sciences .	1.1.1	Define the basic analytical chemistry techniques and their applications.
		1.1.2	Identify the official methods of analysis applied to raw materials and end products.
1.1.3	Integrate knowledge from fundamental sciences to handle, identify, extract, design, prepare, analyze, and assure quality of synthetic/natural pharmaceutical materials/products.	1.1.3	Explain different analytical techniques under good laboratory practice to validate and assure quality of pharmaceutical material and products.
		1.1.4	Perform qualitative and quantitative analysis of pharmaceutical materials.
		1.1.5	Identify active pharmaceutical ingredients using compendial and instrumental methods.
1.1.6	Utilize scientific literature and collect and interpret information to enhance professional decisions .	1.1.6	Integrate information from different scientific resources on recent technologies that contribute to pharmaceutical analytical chemistry in quality control labs.

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
		1.1.7	Locate and summarize primary and secondary scientific sources relevant to pharmaceutical quality control.
1.1.7	Identify and critically analyze newly emerging issues influencing pharmaceutical industry and patient health care.	**1.1.8**	Critically analyze scientific literature and case studies on quality- related issues and assess the impact of such issues on product quality and patient safety and propose evidence-based quality control strategies.
DOMAIN 2: PROFESSIONAL AND ETHICAL PRACTICE 2.2. Competency		**Graduates will be able to determine pharmaceutical active ingredients and their stability in formulations as well as inspection of their shelf lives in addition to calibration of instrumentations.** **This competency will be developed via the following key elements:**	
2.2.2	Apply the basic requirements of quality management system in developing, manufacturing, analyzing, storing, and distributing pharmaceutical materials/ products considering various incompatibilities.	**2.2.1**	Describe the official methods to control quality specifications of dosage forms.
		2.2.2	Isolate active ingredients by solid phase or liquid-liquid extraction, inspection of its purity by different spectroscopic analytical techniques and finally, subjected to analytical quantification.
		2.2.3	Apply the compendial methods for QC/QA of bulk drugs and drug products
		2.2.4	Employ international guidelines concerning QC and QA in sampling, stability indicating assays on storage and incompatibility problems.
2.2.3	Recognize the principles of various tools and instruments and select the proper techniques for synthesis and analysis of different materials and production of pharmaceuticals.	**2.2.5**	Explain the principles of operation and components of the analytical instruments used in pharmaceutical quality control as UV-Vis and HPLC.
		2.2.6	Select and develop analytical methodologies to ensure that the results obtained comply with the pharmacopeial international specifications of both synthetic or natural authentic samples in addition to pharmaceuticals.
		2.2.7	Recognize different sampling techniques, different types of error and validation parameters.
2.3. Competency		**Proper dealing with samples containing active pharmaceutical ingredients either biological, pharmaceutical product or even authentic without deterioration in a manner keeping their physical and**	

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
			chemical characteristics in accordance to national and international regulations. **This competency will be developed via the following key elements:**
2.3.1	Handle, identify, and dispose biologicals, synthetic/natural materials, biotechnology-based and radio-labeled products, and other materials/products used in pharmaceutical fields.	**2.3.1**	Identify the proper treatment of different samples of pharmaceutical interest like those are natural, authentic, nano-formulated, radioactive and pharmaceutical products as well as their characterization.
		2.3.2	Apply the appropriate analytical and quality control techniques to assess the purity, quality, and safety of these materials.
		2.3.3	Handle pharmaceutical materials following official methods to control quality specifications of dosage forms
2.3.2	Recognize and adopt ethical, legal, and safety guidelines for handling and disposal of biologicals, and pharmaceutical materials/products.	**2.3.4**	Recognize the regulations for safe dealing with active pharmaceutical ingredients.
		2.3.5	Apply standard operating procedures (SOPs) to ensure compliance with GMP and GLP during handling.
2.5. Competency		**Participation in optimizing as well as validation of newly developed analytical methods for accurate determination of pharmaceutical products in addition to clinical applications either in volunteers or laboratory animals required for approval.** **This competency will be developed via the following key elements:**	
2.5.1	Fulfill the requirements of the regulatory framework to authorize a medicinal product including quality, safety, and efficacy requirements.	**2.5.1**	Perform analytical identification of analytes as raw material, in dosage forms or in biological fluids as well as determination of their concentration in accordance to ethical research regulations.
		2.5.2	Apply relevant guidelines (ICH, WHO, FDA) in quality control process.
DOMAIN 4: PERSONAL PRACTICE **4.1 .Competency**		**Express leadership, time management, critical thinking, problem solving, independent and team working, creativity and entrepreneurial skills.** **This competency will be developed via the following key elements:**	

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
4.1.1	Demonstrate responsibility for team performance and peer evaluation of other team members, and express time management skills.	**4.1.1**	Interact as a part of team to plan, conduct, and report pharmaceutical quality control experiments.
		4.1.2	Provide peer evaluation of the performance of team members.
		4.1.3	Adhere to a timeline for completion of the tasks.
4.1.2	Retrieve and critically analyze information, identify and solve problems, and work autonomously and effectively in a team.	**4.1.4**	Retrieve information from a variety of sources, including libraries, databases and internet.
		4.1.5	Analyze data and solve scientific problems and use effectively computer programs (EXCEL) to determine the validation parameters.
		4.1.6	Work autonomously to complete analytical QC tasks.
4.1.3	Demonstrate creativity and apply entrepreneurial skills within a simulated entrepreneurial activity.	**4.1.7**	Work in teams to identify a real challenge in pharmaceutical quality control and develop a creative solution.
		4.1.8	Plan appropriate experiments in the laboratory bearing in mind technical availability and time limitations.
4.2 .Competency		**Effectively communicate verbally, non-verbally and in writing with individuals and communities.** **This competency will be developed via the following key elements:**	
4.2.2	Use contemporary technologies and media to demonstrate effective presentation skills.	**4.2.1**	Show the ability to effectively present a topic of interest using recent technologies.
		4.2.2	Use of digital tools to create formative presentations and incorporation of visual aids as charts and images.
4.3. Competency		**Express self-awareness and be a life-long learner for continuous professional improvement.** **This competency will be developed via the following key elements:**	
4.3.1	Perform self-assessment to enhance professional and personal competencies.	**4.3.1**	Perform self-improvements on both academic and research professional levels at all aspects of pharmaceutical analytical chemistry.
		4.3.2	Perform self-assessment of their own practical work by comparing their results with standards to enhance professional competencies and self-estimation.
4.3.2		**4.3.3**	Practice independent learning by giving the opportunity to perform internet search and literature survey so as to

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
	Practice independent learning is needed for continuous professional development.		find out answers to tutorial questions throughout the course.
		4.3.4	Identify learning needs to enhance expertise in pharmaceutical quality control.

4. Teaching and Learning Methods

1. Lectures
2. Practical training / laboratory
3. E- Learning
4. Class Activity
5. Assignment
6. Presentation
7. Case study

Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups/......)	Training (Practical/ Clinical/ ......)	Self-learning (Tasks/ Assignments/	Other (to be determined)
1	Quality control (QC): general introduction and background	4	2	2	-	-
2	Chemical purity of drugs	4	2	2	-	-
3	Impurities in official articles; USP	4	2	2	-	-
4	Official methods to control quality specifications of dosage forms (DF)	4	2	2	-	-
5	Quality standards	4	2	2	-	-
6	Sampling	4	2	2	-	-
7	**Periodical exam**					
8	Documentation	4	2	2	-	-
9	Assay methods of drugs	4	2	2	-	-
10	Compendial methods for QC/QA of bulk drugs and drug products	4	2	2	-	-
11	Applications of spectrophotometric methods in analysis and QC of drugs	4	2	2	-	-
12	Atomic spectroscopy	4	2	2	-	-
13	Validation of analytical procedures	4	2	2	-	-
14	Stability of drugs in their dosage forms	2	2	Practical exam	-	-
15	Stability Indicating Assay Methods (SIAMs)	2	2	Practical exam	-	-

8. Methods of students' assessment

No.	Assessment Methods	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1.	Periodical exam	Week7	15	15%
2.	Final written exam	Week 16,17	50	50%
3.	Final practical exam	Week14,15	20	20%
4.	Final oral exam	Week 16,17	10	10%
5.	Assignments / Project /Portfolio/ Logbook	Week 9	5	5 %

9. Learning Resources and Supportive Facilities

Learning resources (books, scientific references, etc.)	**The main (essential) reference for the course** (must be written in full according to the scientific documentation method)	- Mitra, A. (2021). Fundamentals of quality control and improvement (5th ed.). Wiley.
	Other References	- Shukla, S. S., Pandey, R. K., Gidwani, B., & Kalyani, G. (2023). Pharmaceutical Calibration, Validation and Qualification: A Comprehensive Approach. - World Health Organization. (2024). Quality assurance of pharmaceuticals: a compendium of guidelines and related materials, Volume 1. Good practices and related regulatory guidance.
	Electronic Sources (Links must be added)	www.pubmed.com www.sciencedirect.com
	Learning Platforms (Links must be added)	**https://lms3.kfs.edu.eg/pharm/login/index.php**
	Other (to be mentioned)	-

Supportive facilities & equipment for teaching and learning	**Devices/Instruments**	Laboratory facilities like pH meters, UV/Vis spectrophotometer, and HPLC
	Supplies	Chemicals as reagents and indicators for proper lab work and analytical tools as burettes, pipettes, stands, funnels, and flasks.
	Electronic Programs	--
	Skill Labs/ Simulators	--
	Virtual Labs	--
	Other (to be mentioned)	Data show, smart board, unit for distance learning, computers, internet and library

Course Plan
Matrix of course learning outcomes CLOs- teaching and learning strategy and student assessment

Week	Topic	Key elements	Teaching and Learning Methods	Student Assessment Methods
1	Quality control (QC): general introduction and background	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 2.2.1, 2.2.4, 2.3.4, 2.3.5, 2.5.1, 2.5.2	Lectures, E-learning, and class activity	Written and oral exams
2	Chemical purity of drugs	1.1.1, 1.1.2, 1.1.3, 2.2.1, 2.3.1, 2.3.2, 4.1.1, 4.1.2, 4.2.1, 4.2.2	Lectures, practical training, E-learning, and class activity	Written, practical and oral exams
3	Impurities in official articles; USP	1.1.2, 1.1.3, 1.1.6, 1.1.7, 2.2.1, 2.2.2, 2.3.1, 2.3.2, 4.1.1, 4.1.2, 4.2.1, 4.2.2	Lectures, practical training, E-learning, and class activity	Written, practical and oral exams
4	Official methods to control quality specifications of dosage forms (DF)	1.1.2, 1.1.3, 1.1.5, 1.1.6, 2.2.1, 2.2.2, 2.2.3, 2.2.3, 2.3.4, 2.3.5, 4.1.3, 4.1.4, 4.1.7, 4.1.8	Lectures, practical training, E-learning, and class activity	Written, practical and oral exams
5	Quality standards	2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.3.1, 2.3.2, 2.3.3, 2.3.4, 2.3.5, 2.5.1, 2.5.2, 4.2.1, 4.2.2	Lectures, practical training, E-learning, and class activity	Written, practical and oral exams
6	Sampling	2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.3.1, 2.3.2, 2.3.3, 2.3.4, 2.3.5, 2.5.1, 2.5.2, 4.2.1, 4.2.2	Lectures, practical training, E-learning, and class activity	Written, practical and oral exams
7	**Periodical exam**			
8	Documentation	1.1.2, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.3.1, 2.3.2, 2.3.3, 2.3.4, 2.3.5, 2.5.1, 2.5.2, 4.2.1, 4.2.2, 4.3.1, 4.3.2	Lectures, practical training, E-learning, and class activity	Written, practical and oral exams

9	Assay methods of drugs	1.1.2, 1.1.3, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 2.2.1, 2.2.2, 2.2.3, 2.2.3, 2.2.4, 2.3.4, 2.3.5, 4.3.1, 4.3.2, 4.3.3, 4.3.4	Lectures, practical training, E-learning, and class activity	Written, practical and oral exams
10	Compendial methods for QC/QA of bulk drugs and drug products	1.1.2, 1.1.3, 1.1.5, 1.1.6, 1.1.8, 2.2.1, 2.2.2, 2.2.3, 2.2.3, 2.2.4, 2.3.4, 2.3.5, 4.3.1, 4.3.2, 4.3.3, 4.3.4	Lectures, practical training, E-learning, and class activity	Written, practical and oral exams
11	Applications of spectrophotometric methods in analysis and QC of drugs	1.1.2, 1.1.3, 1.1.5, 1.1.6, 1.1.8, 2.2.1, 2.2.2, 2.2.3, 2.2.3, 2.2.4, 2.3.4, 2.3.5, 4.3.1, 4.3.2, 4.3.3, 4.3.4	Lectures, practical training, E-learning, and class activity	Written, practical and oral exams
12	Atomic spectroscopy	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 2.2.1, 2.2.5, 2.2.6, 2.3.3, 4.3.1, 4.3.2	Lectures, practical training, E-learning, and class activity	Written, practical and oral exams
13	Validation of analytical procedures	1.1.2, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.3.1, 2.3.2, 2.3.3, 2.3.4, 2.3.5, 2.5.1, 2.5.2, 4.1.5, 4.1.6, 4.2.1, 4.2.2, 4.3.1, 4.3.2	Lectures, practical training, E-learning, and class activity	Written, practical and oral exams
14	Stability of drugs in their dosage forms	1.1.2, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.3.1, 2.3.2, 2.3.3, 2.3.4, 2.3.5, 2.5.1, 2.5.2, 4.1.5, 4.1.6, 4.2.1, 4.2.2, 4.3.1, 4.3.2	Lectures, E-learning, and class activity	Written and oral exams
15	Stability Indicating Assay Methods (SIAMs)	1.1.2, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.3.1, 2.3.2, 2.3.3, 2.3.4, 2.3.5, 2.5.1, 2.5.2, 4.1.5, 4.1.6, 4.2.1, 4.2.2, 4.3.1, 4.3.2	Lectures, E-learning, and class activity	Written and oral exams

Name and Signature
Course Coordinator
Prof. Dr. Fathalla Belal

Name and Signature
Program Coordinator
Prof. Dr. Ahmed Amin

Course Specification (2025)

1. Basic Information

Course Title (according to the bylaw)	Drug Design
Course Code (according to the bylaw)	PC E6
Departments participating in the delivery of the course	Pharmaceutical Chemistry Department

Number of credit hours/points of the course (according to the bylaw)	Theoretical	Practical	Other (specify)	Total
	1	1	--------	2

Course Type	Elective
Academic level at which the course is taught	Fourth level, Semester (1)
Academic Program	Bachelor of Pharmacy (PharmD) (Clinical Pharmacy)
Faculty/Institute	Faculty of Pharmacy
University/Academy	Kafrelsheikh University
Name of Course Coordinator	Associate Prof. Wagdy Mohamed Eldehna
Course Specification Approval Date	9/2025
Course Specification Approval	Department Council

2. Course Overview (Brief summary of scientific content)

This course covers basic principles, theoretical basis, and practical experience of different methods of drug design and different approaches in the field of design.

3. Course Learning Outcomes CLOs

Matrix of course learning outcomes CLOs with program outcomes POs (NARS/ARS)

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
Domain 1 (Fundamental Knowledge) **1.1-COMPETENCY**		Upon completing this course, students will be able to integrate knowledge from basic and applied pharmaceutical and clinical sciences to standardize materials, formulate and manufacture products, and deliver population and patient-centered care. This competency will be developed via the following key elements:	
1.1.1	Demonstrate understanding of knowledge of pharmaceutical, biomedical, social, behavioral, administrative, and clinical sciences.	**1.1.1**	Explain the principles of rational drug design, including structure-based and ligand-based approaches.
		1.1.2	Relate drug chemical structures to their biological targets (enzymes, receptors, nucleic acids).
		1.1.3	Describe the pharmacological and clinical implications of structural modifications in drug molecules.
		1.1.4	Interpret how molecular properties (e.g., solubility, lipophilicity, ionization) affect drug action, distribution, and clinical use.
1.1.3	Integrate knowledge from fundamental sciences to handle, identify, extract, design, prepare, analyze, and assure the quality of	**1.1.5**	Use structure–activity relationship (SAR) analysis to guide molecular modifications.
		1.1.6	Employ computational chemistry and molecular modeling to predict binding affinity and optimize drug–target interactions.

2

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
	synthetic/natural pharmaceutical materials/products.	**1.1.7**	Evaluate physicochemical properties and ADMET (absorption, distribution, metabolism, excretion, toxicity) parameters during drug optimization.
1.1.6	Utilize scientific literature and collect and interpret information to enhance professional decisions.	**1.1.8**	Retrieve and analyze updated drug design research from scientific databases and journals.
		1.1.9	interpret data on lead discovery, target validation, and molecular docking to support drug design decisions.
DOMAIN 2: PROFESSIONAL AND ETHICAL PRACTICE 2-2- COMPETENCY		**Upon completing this course, students will be able to standardize pharmaceutical materials, formulate and manufacture pharmaceutical products, and participate in systems for dispensing, storage, and distribution of medicines.** **This competency will be developed via the following key elements:**	
2.2.1	Isolate, design, identify, synthesize, purify, analyze, and standardize synthetic/natural pharmaceutical materials.	**2.2.1**	Design potential drug molecules through lead optimization strategies.
		2.2.2	Propose synthetic routes for novel drug candidates based on retrosynthetic analysis
		2.2.3	Apply computational techniques to predict and refine drug–target interactions
		2.2.4	Identify and validate structural features critical for drug activity and selectivity.
2.2.2	Apply the basic requirements of a quality management system in developing, manufacturing, analyzing, storing, and distributing pharmaceutical materials/ products considering various incompatibilities.	**2.2.5**	Assess drug candidates for stability and chemical compatibility during development.
		2.2.6	Identify chemical and metabolic incompatibility during drug optimization.
2.2.3	Recognize the principles of various tools and instruments and select the	**2.2.7**	Utilize molecular docking, pharmacophore modeling, and QSAR tools in drug design

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	Text	Code	Text
	proper techniques for synthesis and analysis of different materials and production of pharmaceuticals.	2.2.8	Apply computational chemistry software (e.g., AutoDock, MOE, Schrödinger) for structural analysis.
		2.2.9	Select appropriate in vitro and in silico techniques to evaluate drug candidates.
2-5- COMPETENCY		**Upon completing this course, students will be able to contribute to pharmaceutical research studies and clinical trials needed to authorize medicinal products.** **This competency will be developed via the following key elements:**	
2.5.3	Contribute in planning and conducting research studies using appropriate methodologies.	2.5.1	Design computational and experimental methodologies for new drug discovery.
		2.5.2	Apply appropriate drug design strategies (de novo design, hybrid design, bioisosteric replacement) in research.
		2.5.3	Analyze and interpret research data to draw valid conclusions and propose further studies.
DOMAIN 4: Personal Practice 4-1- COMPETENCY		**Upon completing this course, students will be able to express leadership, time management, critical thinking, problem solving, independent and team working, creativity and entrepreneurial skills.** **This competency will be developed via the following key elements:**	
4.1.1	Demonstrate responsibility for team performance and peer evaluation of other team members, and express time management skills.	4.1.1	Collaborate effectively in team-based drug design projects.
		4.1.2	Manage time efficiently to complete molecular modeling and design assignments.
4.1.2	Retrieve and critically analyze information, identify and solve	4.1.3	Critically analyze literature on drug–target interactions and apply findings to design tasks.

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	Text	Code	Text
	problems, and work autonomously and effectively in a team.	4.1.4	Collaborate in group discussions to solve complex medicinal chemistry design problems.
		4.1.5	Identify problems in drug discovery pipelines and propose rational design solutions.
4-2- COMPETENCY		**Upon completing this course, students will be able to effectively communicate verbally, non-verbally, and in writing with individuals and communities.** **This competency will be developed via the following key elements:**	
4.2.2	Use contemporary technologies and media to demonstrate effective presentation skills.	4.2.1	Prepare digital presentations illustrating drug design strategies and SAR studies.
		4.2.2	Use molecular visualization software to present drug–target interactions effectively.
		4.2.3	Develop posters and infographics summarizing drug design research.
		4.2.4	Deliver oral presentations integrating chemical, pharmacological, and computational data.
4-3- COMPETENCY		**Upon completing this course, students will be able to express self-awareness and be a lifelong learner for continuous professional improvement.** **This competency will be developed via the following key elements:**	
4.3.1	Perform self-assessment to enhance professional and personal competencies.	4.3.1	Reflect on personal strengths and weaknesses in drug design skills (e.g., computational tools, SAR interpretation).
		4.3.2	Develop action plans for continuous improvement in drug design methodologies.
		4.3.3	Maintain updated knowledge of novel approaches in rational drug design.

4. Teaching and Learning Methods

1- Lectures   (√)

2- E-learning   (√)

3- Practical training/ laboratory   (√)

4- Discussion (√)

5- Brainstorming (√)

6- Assignments (√)

7- Case study   (√)

8- Seminars   (√)

Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/ discussion groups/ ......)	Training (Practical/ Clinical/ ......)	Self-learning (Tasks/ Assignments/ Projects/ ...)	Other (to be determined)
1	Introduction to drug design, Drug Targets and Types of drug interactions	3	1	2	---	---
2	Design of agonists and antagonists, Bioisosterism, stereochemistry and biological activity	3	1	2	---	---
3	Stages of drug design	3	1	2	---	---
4	Lead optimization	3	1	2	---	---
5	Lead optimization	3	1	2	---	---
6	Drug Metabolism	3	1	2	---	---
7	**Semester works**					
8	Drug Metabolism	3	1	2	---	---
9	Prodrugs	3	1	2	---	---
10	Prodrugs	3	1	2	---	---
11	Molecular Modelling (Molecular Docking)	3	1	2	---	---
12	Molecular Modelling (Pharmacophore Modelling)	3	1	2	---	---
13	Quantitative Structure Activity Relationship (QSAR)	3	1	2	---	---
14	Combinatorial chemistry	1	1	**Practical exam**		
15	Revision	1	1	**Practical exam**		

5. Methods of students' assessment

No.	Assessment Methods	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Periodical exam	Week 7	15 marks	15%
2	Final Practical/Clinical/… Exam	Week 14,15	25 marks	25%
3	Final Written Exam	Week 16,17	50 marks	50%
4	Final Oral Exam	Week 16,17	10 marks	10%
	Total		100	100%

6. Learning Resources and Supportive Facilities

Learning resources (books, scientific references, etc.)	The main (essential) reference for the course	Notes on Drug Design prepared and distributed by Dept. of Pharmaceutical Chemistry. Lab Manual of Drug Design prepared and distributed by Dept. of Pharmaceutical Chemistry.
	Other References	Gerhard Klebe, Drug Design: Methodology, Concepts, and Mode-of-Action,2013, Springer, Berlin, Heidelberg Kenneth M. Merz, Charles H. Reynolds, "Drug Design: Structure- and Ligand-Based Approaches" 1st edition ,2010, Cambridge University Press
	Electronic Sources	www.pdb.org http://www.sciencedirect.com/ https://pubmed.ncbi.nlm.nih.gov/
	Learning Platforms	https://lms3.kfs.edu.eg/pharm/login/index.php

Supportive facilities & equipment for teaching and learning	Devices/Instruments	Data show, Computers, Library, Internet.
	Supplies	Classrooms, Computer Lab
	Skill Labs/ Simulators	Computer Lab

Course Plan

Matrix of course learning outcomes CLOs – Teaching and Learning Strategy and Student Assessment

Course title: Drug Design   **Course code: PC E6**

Course Contents		Key elements	Teaching and Learning Methods	Student Assessment Methods
Week # 1	**Introduction to drug design, Drug Targets and Types of drug interactions**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.5.1, 2.5.2, 2.5.3, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.2.1, 4.2.2, 4.2.3, 4.2.4, 4.3.1, 4.3.2, 4.3.3.	Lectures, E-learning practical training and class activities	Written, practical and oral exams
Week # 2	**Design of agonists and antagonists, Bioisosterism, stereochemistry and biological activity**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.5.1, 2.5.2, 2.5.3, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.2.1, 4.2.2, 4.2.3, 4.2.4, 4.3.1, 4.3.2, 4.3.3.	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
Week # 3	**Stages of drug design**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.5.1, 2.5.2, 2.5.3, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.2.1, 4.2.2, 4.2.3, 4.2.4, 4.3.1, 4.3.2, 4.3.3.	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
Week # 4	**Lead optimization**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.5.1, 2.5.2, 2.5.3, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.2.1, 4.2.2, 4.2.3, 4.2.4, 4.3.1, 4.3.2, 4.3.3.	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
Week # 5	**Lead optimization**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.5.1, 2.5.2, 2.5.3, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.2.1, 4.2.2, 4.2.3, 4.2.4, 4.3.1, 4.3.2, 4.3.3.	Lectures, E-learning, practical training and class activities	Written, practical and oral exams

Week # 6	**Drug Metabolism**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.5.1, 2.5.2, 2.5.3, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.2.1, 4.2.2, 4.2.3, 4.2.4, 4.3.1, 4.3.2, 4.3.3.	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
Week # 7	**Semester works**			
Week # 8	**Drug Metabolism**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.5.1, 2.5.2, 2.5.3, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.2.1, 4.2.2, 4.2.3, 4.2.4, 4.3.1, 4.3.2, 4.3.3.	Lectures, E-learning, practical training, and class activities	Written, practical, and oral exams
Week # 9	**Prodrugs**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.5.1, 2.5.2, 2.5.3, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.2.1, 4.2.2, 4.2.3, 4.2.4, 4.3.1, 4.3.2, 4.3.3.	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
Week # 10	**Prodrugs**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.5.1, 2.5.2, 2.5.3, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.2.1, 4.2.2, 4.2.3, 4.2.4, 4.3.1, 4.3.2, 4.3.3.	Lectures, E-learning, practical training, and class activities	Written, practical, and oral exams
Week # 11	**Molecular Modelling (Molecular Docking)**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.5.1, 2.5.2, 2.5.3, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.2.1, 4.2.2, 4.2.3, 4.2.4, 4.3.1, 4.3.2, 4.3.3.	Lectures, E-learning, practical training, seminars and class activities	Written, practical and oral exams
Week # 12	**Molecular Modelling (Pharmacophore Modelling)**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.5.1, 2.5.2, 2.5.3, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.2.1, 4.2.2, 4.2.3, 4.2.4, 4.3.1, 4.3.2, 4.3.3.	Lectures, E-learning, seminars and practical training	Written, practical and oral exams

Week # 13	**Quantitative Structure Activity Relationship (QSAR)**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.5.1, 2.5.2, 2.5.3, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.2.1, 4.2.2, 4.2.3, 4.2.4, 4.3.1, 4.3.2, 4.3.3.	Lectures and E-learning	Written, practical and oral exams
Week # 14	**Combinatorial chemistry**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.5.1, 2.5.2, 2.5.3, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.2.1, 4.2.2, 4.2.3, 4.2.4, 4.3.1, 4.3.2, 4.3.3.	Lectures and E-learning	Written and oral exams
Week # 15	**Revision**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.5.1, 2.5.2, 2.5.3, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.2.1, 4.2.2, 4.2.3, 4.2.4, 4.3.1, 4.3.2, 4.3.3.	Lectures and E-learning	Written and oral exams

**Name and Signature
Course Coordinator**

Associate. Prof. Wagdy Mohamed Eldehna

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