وحدة ضمان الجودة

Courses Specifications
Faculty of Pharmacy

Bachelor of pharmacy- Pharm D

Program

Fourth level

2025-2026

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وحدة ضمان الجودة

Semester 7

COURSE SPECIFICATIONS

Pharmacology IV

Fourth year – semester 7
2025-2026

Course Specification

(2025-2026)

1. Basic Information

Course Title (according to the bylaw)	Pharmacology IV			
Course Code (according to the bylaw)	PO 704			
Department/s participating in delivery of the course	Pharmacology and Toxicology			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	1 hr/week	1 hr/week	-	2 hrs/week
Course Type	Faculty Requirements			
Academic level at which the course is taught	Level 4 - Semester 7			
Academic Program	Bachelor of Pharmacy-Pharm D			
Faculty/Institute	Faculty of Pharmacy			
University/Academy	Zagazig University			
Name of Course Coordinator	Prof. Dr. Salah Ghareib			
Course Specification Approval Date	18-8-2025			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council			

2. Course Overview (Brief summary of scientific content)

On completion of the course, students will be able to :

• Comprehensively understand antimicrobial and antiparasitic drugs, including their classifications, mechanisms of action, therapeutic uses, resistance patterns, and potential adverse effects.

• Select, use, and advise on appropriate antimicrobial therapy based on pharmacological principles and clinical considerations, contributing to rational drug use and infection control. Evaluate and select the appropriate anti-microbial for a given infection/disease based on etiology, possible interactions and patient-related factors.

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**
1-1-1	Demonstrate understanding of knowledge of pharmaceutical, biomedical, social, behavioral, administrative, and clinical sciences.	**1.C1.3.1**	Define the classification and pharmacokinetics of antimicrobial agents, including antibiotics, antifungals, antivirals, antiprotozoals, and anthelmintics.
		1.C1.3.2	Describe the mechanisms of action, spectrum of activity, and clinical applications of major antimicrobial drug classes.
1-1-4	Articulate knowledge from fundamental sciences to explain drugs' actions and evaluate their appropriateness, effectiveness, and safety in individuals and populations.	**1.C1.10.1**	Interpret drug interactions, contraindications, and adverse effects associated with antimicrobial therapy.
		1.C1.11.1	Apply knowledge of microbiology and pharmacology to optimize antimicrobial therapy and monitor treatment 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**
		1.C1.12.1	Compare and evaluate different classes of antimicrobial agents for the treatment of specific infections based on etiology, patient factors, and pharmacological profiles.
2-4-3	Take actions to solve any identified medicine-related and pharmaceutical care problems.	**2.C4.3.1**	Identify and appropriately manage antimicrobial-related problems, including adverse drug reactions, contraindications, hypersensitivity reactions, and clinically significant drug-drug and drug-food interactions.
3-1-4	Relate etiology, epidemiology, pathophysiology, laboratory diagnosis, and clinical features of infections/diseases and their pharmacotherapeutic approaches.	**3.C1.4.1**	Select appropriate antimicrobial therapy based on the etiology, epidemiology, pathophysiology, laboratory findings, and clinical presentation of infectious diseases.
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.C2.1.1**	Select appropriate antimicrobial therapy based on the etiology, epidemiology, pathophysiology, laboratory findings, and clinical presentation of infectious diseases.
4-1-1	Demonstrate responsibility for team performance and peer evaluation of other team members, and express time management skills.	**4.C1.3.1**	Apply effective time management skills, as evidenced by the ability to plan, prioritize, and implement tasks through an efficient and organized approach to professional responsibilities.
4-1-2	Retrieve and critically analyze information, identify and solve problems, and work autonomously and effectively in a team.	**4.C1.5.1**	Demonstrate the ability to apply critical thinking, problem-solving, and evidence-based decision-making skills in the context of antimicrobial therapy and pharmacy practice.
4-2-2	Use contemporary technologies and media to demonstrate effective presentation skills.	**4.C2.2.1**	Demonstrate proficiency in utilizing information technology tools for research, data analysis, and clinical decision-making, as well as effective presentation skills to communicate antimicrobial-related information clearly and professionally.

4. Teaching and Learning Methods

1. Lectures (data show, board)
2. Practical sessions (data show, board, Case-Based Learning)
3. Self- learning (Activity)
4. Problem-based learning (Activity)
5. Team-based learning (Activity)
6. Blended Learning (Activity)

5. 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	**Lecture** Endocarditis	**1**	**1**	**-**	**-**	**-**
	Practical session Case Studies of endocarditis	**2**	**-**	**1**	**-**	**-**
2	**Lecture** Surgical prophylaxis	**1**	**1**	**-**	**-**	**-**
	Practical session Case Studies of surgical prophylaxis	**2**	**-**	**1**	**-**	**-**
3	**Lecture** Pneumonia	**1**	**1**	**-**	**-**	**-**
	Practical session Case Studies of pneumonia	**2**	**-**	**1**	**-**	**-**
4	**Lecture** Pneumonia **Formative assessment (quiz 1)**	**1**	**1**	**-**	**-**	**-**
	Practical session Case Studies of pneumonia	**2**	**-**	**1**	**-**	**-**

5	**Lecture** Skin and skin-structure infections	**1**	**1**	**-**	**-**	**-**
	Practical session Case study of skin and skin-structure infections	**2**	**-**	**1**	**-**	**-**
6	**Lecture** Influenza; Sinusitis, RSV infection	**1**	**1**	**-**	**-**	**-**
	Practical session Case study of Influenza; Sinusitis, RSV infection	**2**	**-**	**1**	**-**	**-**
7	**Midterm exam**					
8	**Lecture** Meningitis; Brain abscess	**1**	**1**	**-**	**-**	**-**
	Practical session Case study of Meningitis; Brain abscess	**2**	**-**	**1**	**-**	**-**
9	**Lecture** Acute otitis media; eye infection **Formative assessment (quiz 2)**	**1**	**1**	**-**	**-**	**-**
	Practical session Case study of Acute otitis media; eye infection	**2**	**-**	**1**	**-**	**-**
10	**Lecture** Urinary tract infections	**1**	**1**	**-**	**-**	**-**
	Practical session Case study of Urinary tract infections	**2**	**-**	**1**	**-**	**-**
11	**Lecture** Clostridium difficile infection	**1**	**1**	**-**	**-**	**-**
	Practical session Case study of clostridium difficile infection	**2**	**-**	**1**	**-**	**-**
12	**Lecture** Peritonitis **Formative assessment (quiz 3)**	**1**	**1**	**-**	**-**	**-**
	Practical session Case study of Peritonitis Discussion and Assessment of activity	**2**	**-**	**1**	**-**	**-**
13	**Lecture** Osteomyelitis	**1**	**1**	**-**	**-**	**-**
	Practical session Case study of Osteomyelitis	**2**	**-**	**1**	**-**	**-**

	Activity presentation					
14	**Lecture** General discussion and revision	**1**	**1**	-	-	-
	Practical exam					
15	**Final written exam**					

6. Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Mid-term exam	Week 7	10	10%
2	Activity	Week 12	5	5 %
3	Practical exam	Week 14	25	25 %
4	Final Written Exam	Week 15	50	50%
5	Oral exam	Week 15	10	10%
6	Formative exams	Weeks 4,9,12	-	-
7	Other (Mention)	-	-	-

7. 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)	- Student book of "Pharmacology IV" approved by the Pharmacology and Toxicology department (2025-2026); Practical notes of Pharmacology IV approved by the Pharmacology and Toxicology department (2025-2026)

	Other References	1. Lippincott's Illustrated Reviews. Pharmacology 7th edition 2. ACCP Updates in Therapeutics® 2024: Pharmacotherapy 3. The Sanford Guide to Antimicrobial Therapy 2020
	Electronic Sources (Links must be added)	- Katzung & Trevor's Basic & Clinical Pharmacology https://archive.org/details/basic-clinical-pharmacology-katzung-14e - Rang & Dale's Pharmacology https://archive.org/details/rang-dales-pharmacology-9th-edition - Medscape https://www.medscape.com/
	Learning Platforms (Links must be added) **Electronic platform of Faculty of Pharmacy- Zagaig University for students**	http://phstudent.eps.zu.edu.eg/Views/StudentViews/StudentLogin
	Other (to be mentioned)	-
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	White board, Data show, computer
	Supplies	-
	Electronic Programs	1. Microsoft office 2. Microsoft teams
	Skill Labs/ Simulators	-
	Virtual Labs	-
	Other (to be mentioned)	-

Name and Signature **Course Coordinator** **Prof. Dr. Salah Ghareib**	**Name and Signature** **Head of Department** **Prof. Dr. Islam Ahmed**

COURSE SPECIFICATIONS

Clinical Biochemistry

Fourth year – semester 7
2025-2026

Course Specification

(2025-2026)

1. Basic Information

Course Title (according to the bylaw)	**Clinical Biochemistry**			
Course Code (according to the bylaw)	**PB 704**			
Department/s participating in delivery of the course	**Biochemistry department**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	2 hrs	**1 hr**	**-**	**3 hrs**
Course Type	**Faculty requirement**			
Academic level at which the course is taught	**Fourth level/ semester 7**			
Academic Program	**Bachelor of Pharmacy (Pharm D)**			
Faculty/Institute	**Faculty of Pharmacy**			
University/Academy	**Zagazig University**			
Name of Course Coordinator	**Prof.Dr. Mohamed ElSweedy**			
Course Specification Approval Date	**18/8/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	**Department council**			

2. Course Overview (Brief summary of scientific content)

This course provides an overview of the fundamental principles and clinical aspects of clinical biochemistry and pathology. It covers disorders of the endocrine system, highlighting mechanisms of hormone imbalance and related diseases. The course also introduces tumor markers and plasma proteins as diagnostic and prognostic tools. Major diseases affecting vital organs such as the liver, kidney, gastrointestinal tract, heart, and bone are discussed along with their biochemical basis and laboratory diagnosis. In addition, students will study essential

diagnostic techniques including blood analysis, urine analysis, evaluation of acid–base balance, and assessment of electrolyte disturbances. The course emphasizes on integration of biochemical findings with clinical interpretation to enhance understanding of disease processes and their management.

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**
1-1-1	Demonstrate understanding of knowledge of pharmaceutical, biomedical, social, behavioral, administrative, and clinical sciences.	1.C1.3.1	Explain the importance of tumor markers and plasma proteins abnormalities identification.
		1.C1.3.2	Describe the principles of Clinical biochemistry and pathophysiology, diagnosis and management of disorders of liver, kidney, bone, heart and GIT.
		1.C1.3.3	Identify blood function, diagnosis of anemia and urine analysis interpretation.
		1.C1.3.4	Discuss acid base balance and electrolytes
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.C3.1.1	Identify appropriate methods for handling and disposing biological samples and chemical reagents.
3-1-1	Apply the principles of body functions and basis of genomics in health and disease states to manage different diseases.	3.C1.1.1	Discuss how disruptions in biochemical pathways and genomic control contribute to disease development

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**
3-1-3	Monitor and control microbial growth and carry out laboratory tests for identification of infections/ diseases	3.C1.3.1	Perform biochemical laboratory tests to diagnose kidney dysfunctions, liver dysfunctions and interpret urine analysis
4-1-2	Retrieve and critically analyze information, identify and solve problems, and work autonomously and effectively in a team.	4.C1.4.1	Analyze and collect data from different sources.
4-2-2	Use contemporary technologies and media to demonstrate effective presentation skills.	4.C2.2.1	Write and present reports effectively and develop self-learning skills.

4. Teaching and Learning Methods

Lectures

Practical sessions

Case study

Self-learning (Activities, Open discussion ...)

5. 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	**lecture** Introduction to clinical biochemistry.	**2**	**2**	**-**	**-**	**-**
	Practical session Lab safety rules and handling and preservation of biological samples	**2**	**-**	**1**	**-**	**-**
2	Tumor markers and recent diagnostic biomarkers.	**2**	**2**	**-**	**-**	**-**
	Practical session Adrenal gland disorder and case study	**2**	**-**	**1**	**-**	**-**
3	**lecture** Plasma protein and lipoprotein **Formative assessment (Quiz 1)**	**2**	**2**	**-**	**-**	**-**
	Practical session Thyroid gland disorder and case study	**2**	**-**	**1**	**-**	**-**
4	**lecture** Biochemical /pathophysiological changes and laboratory diagnostic markers of disorders of: Gastric function	**2**	**2**	**-**	**-**	**-**
	Practical session Liver function test Quantitative determination of serum albumin	**2**	**-**	**1**	**-**	**-**

5	**lecture** Hepatic function	**2**	**2**	**-**	**-**	**-**
	Practical session Quantitative determination of serum total protein	**2**	**-**	**1**	**-**	**-**
6	**lecture** Renal function	**2**	**2**	**-**	**-**	**-**
	Practical session Bilirubin and case study	**2**	**-**	**1**	**-**	**-**
7	**Midterm exam**					
8	**Lecture** Bone disorders	**2**	**2**	**-**	**-**	**-**
	Practical session Kidney function test and case study	**2**	**-**	**1**	**-**	**-**
9	**lecture** Acid – base balance	**2**	**2**	**-**	**-**	**-**
	Practical session Quantitative determination of serum uric acid	**2**	**-**	**1**	**-**	**-**
10	**lecture** Electrolytes	**2**	**2**	**-**	**-**	**-**
	Practical session Urine analysis	**2**	**-**	**1**	**-**	**-**
11	**lecture** Biochemical /pathophysiological changes and laboratory diagnostic markers of disorders of: Cardiac function **Formative assessment (Quiz 2)**	**2**	**2**	**-**	**-**	**-**

	Practical session Activity on -Urine analysis and applications -Bone disorders and its biomarkers with case study **+ formative assessment (Quiz 2)**	**2**	-	**1**	-	-
12	**lecture** Blood analysis.	**2**	**2**	-	-	-
	Practical session Revision	**2**	-	**1**	-	-
13	**lecture** Urine analysis	**2**	**2**	-	-	-
	Practical session Practical exam	**2**	-	**1**	-	-
14	**Lecture** Revision and open discussion	**2**	**2**	-	-	-
	Practical lab Discussion on activity*	**2**	-	**1**	**-***	-
15	**Written exam**					

*As part of a self-learning activity, practical session in week 14 were facilitated for students to present their reports on various topics. This session was designed to go beyond mere presentation; supervisors engaged students in a discussion to evaluate the key skills acquired, findings, and conclusions they reached. The activity was formally evaluated against a set of established criteria to ensure a rigorous and consistent assessment.

6. Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Exam 1written (**midterm exam**)	**Week 7**	**10**	**10%**
2	Exam 2 ..... (Semester work)	-	-	-
3	Final Written Exam	**Week 15**	**50**	**50%**
4	Final **Practical**/Clinical/… Exam	**Week 13**	**25**	**25%**
5	Final Oral Exam	**Week 15**	**10**	**10%**
6	Project (self-learning activity)	**Week 11,14**	**5**	**5%**
7	Assignments (formative assessment)	**Week 3,11**	-	-
9	Other (Mention)	-	-	-

*** The methods mentioned are examples, the organization may add and/or delete**

7-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)	**1- Course Notes:** Student book of Clinical Biochemistry approved by biochemistry department 2025-2026. - Practical notes of Clinical Biochemistry approved by biochemistry department 2025-2026
	Other References	**2- Essential books:** i- Clinical biochemistry: An illustrated color textbook (seventh edition); Michael Murphy, Rajeev Srivastava, Kevin Deans Elsevier (2023). ii- Text book of Biochemistry with clinical correlations (seventh edition); Devlin T.M.; A John Willey& Sons Inc. (2010). iii- Medical Biochemistry (second edition); Antonio Blanco, Gustavo Blanco Elsevier (2022). iii- Essentials of medical biochemistry with clinical cases (third edition); Bahagavan N.V, Chung-Eun Ha; Elsevier Inc. (2022). **3- Recommended books** i- Lippincott's Illustrated Review Biochemistry (nineth edition);

		Ferrier D.R., Harvey R.A.; Lippincott Williams & Wilkins (2025). ii- Tietz Fundamentals of Clinical Chemistry Fundamentals (nineth edition) ; Burtis C.A., Ashwood E.R.; W.B. Saunders company (2023).
	Electronic Sources (Links must be added)	https://www.ekb.eg/ www.Pubmed.Com www.sciencedirect.com
	Learning Platforms (Links must be added)	http://phstudent.eps.zu.edu.eg/Views/StudentViews/StudentLogin?fbclid=IwY2xjawdFFJleHRuA2FIbQlxMABlcrmlkETE4NnlETkJETktxTE52Rm9nAR6xscpW6bG66rStVoyb6l8uGS6Z03ZZEIUMZ6-Y_tuPx8ubMLmaz7AG0U8NQ_aem_gV2cGYHV6OFtgTMHUjgilA
	Other (to be mentioned)	Indian J. of Clinical Biochemistry Egyptian J. of biochem. and molecular biology. Annals of Clinical Biochemistry Arab J. of Laboratory Medicine, J. of Cardiovascular diseases.
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	• Laptop • Data show • Spectrophotometer • White board • Centrifuge
	Supplies	• Pipettes • Eppendorf tubes • Beakers • Cuvettes • Chemical kit • Test tubes

	Electronic Programs	Microsoft office Microsoft team
	Skill Labs/ Simulators	-
	Virtual Labs	-
	Other (to be mentioned)	-

*** The list mentioned is an example, the institution may add and/or delete depending on the nature of the course**

Name and Signature **Course Coordinator** **Prof.Dr. Mohamed ElSweedy**	**Name and Signature** **Head of the department** **Ass.Prof. Rana Eissa**

COURSE SPECIFICATIONS

Applied & Forensic Pharmacognosy

Fourth year – semester 7
2025-2026

Course Specification

(2025-2026)

1. Basic Information

Course Title (according to the bylaw)	Applied and Forensic Pharmacognosy			
Course Code (according to the bylaw)	PG 706			
Department/s participating in delivery of the course	Pharmacognosy department			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	1 hrs/week	1 hrs/week	-	2 hrs/week
Course Type	Faculty Requirements			
Academic level at which the course is taught	Level 4 -Semester 7			
Academic Program	Bachelor of Pharmacy (Pharm D)			
Faculty/Institute	Faculty of pharmacy			
University/Academy	Zagazig university			
Name of Course Coordinator	Prof. Dr./ Fawkeya Abass			
Course Specification Approval Date	18/8/2025			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council			

2. Course Overview (Brief summary of scientific content)

The Course is to describe Quality control of herbal preparation concerning with sampling, structural, physical, analytical standards, purity, safety, adulteration of drugs and their detection. Also it describes Chromatographic application to

perform qualitative and quantitative analysis of natural products, Plant biotechnology application to produce pharmaceutically active materials, Forensic pharmacognosy includes plants and their natural products and Narcotic drugs.

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**
1.1.1	Demonstrate understanding of knowledge of pharmaceutical, biomedical, social, behavioral, administrative, and clinical sciences.	**1C1.2.1**	Outline the principles of production and evaluation of natural products (crude drugs and isolates) by organoleptic characters, macroscopical, microscopical, chromatographic, ...etc
		1C1.2.2	Outline different chromatographic techniques for analysis and evaluation especially GC and HPLC
1.1.2	Utilize the proper pharmaceutical and medical terms, abbreviations and symbols in pharmacy practice	**1C1.8.1**	Outline the principles of plant biotechnology and genetic engineering
1.1.3	Integrate knowledge from fundamental sciences to handle, identify, extract, design, prepare, analyze, and assure quality of synthetic/ natural pharmaceutical Materials/products.	**1C1.9.1**	Demonstrate principles and approaches about narcotic drugs and forensic pharmacognosy.
2.2.1	Isolate, design, identify, synthesize, purify, analyze, and standardize synthetic/ natural pharmaceutical materials.	**2C2.1.1**	Perform different quality control tests to evaluate herbal medicine.
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.	**2C2.5.1**	Select the appropriate chromatographic methods for analysis of natural products

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**
2.3.1	Handle, identify, and dispose biologicals, synthetic/natural materials, biotechnology-based and radio-labeled products, and other materials/products used in pharmaceutical field.	**2C3.1.1**	Handle and dispose chemicals in a safe way.
2.4.3	Take actions to solve any identified medicine-related and pharmaceutical care problems.	**2C4.3.1**	Test for narcotic and poisonous drugs.
3.2.3	Provide evidence-based information about safe use of complementary medicine Including phytotherapy, aromatherapy, and nutraceuticals.	**3C2.3.1**	Provide recommendations for patients about use of medicines.
3.2.4	Provide information about toxic profiles of drugs and other xenobiotics including sources, identification, symptoms, and management control.	**3C2.4.1**	Educate patients and community about toxic profiles of herbal and narcotic drugs
3.2.6	Maintain public awareness on social health hazards of drug	**3C2.6.1**	Advise health care professionals & patients concerning social health hazards of drug abuse and misuse.
4.1.2	Retrieve and critically analyze information, identify and solve problems, and work autonomously and effectively in a team	**4C1.5.1**	Demonstrate responsibility for team performance and peer evaluation of other team members and critically analyze information, identify and solve problems
4.2.2	Use contemporary technologies and media to demonstrate effective presentation skills.	**4.C2.2.1**	Develop information technology skills as well as presentation skills.

4. Teaching and Learning Methods

1. Lectures (data show, board)
2. Practical sessions
3. Problem solving (Practical)
4. Self- learning (Activity)
5. Blended- learning (Activity)
6. Field visit (Practical)

5. 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	**Lecture** -Introduction about quality control -Preparation of herbal drugs	**1**	**1**	**-**	**-**	**-**
	Practical session -Introduction of quality control of crude drugs (physical characters, analytical evaluation, biological screening .. etc	**2**	**-**	**1**	**-**	**-**
2	**Lecture** -Adulteration of herbal drugs -Sampling of drugs for evaluation	**1**	**1**	**-**	**-**	**-**
	Practical session -Checking the purity of herbal drugs using microscopical examination. - Orientation on Activity 1: Model for drug profile.	**2**	**-**	**1**	**-**	**-**
3	**Lecture** -Evaluation of herbal drugs using structural, physical and analytical standards	**1**	**1**	**-**	**-**	**-**
	Practical session -Checking the purity of herbal drugs using microscopical examination.	**2**	**-**	**1**	**-**	**-**
4	**Lecture** -Purity and safety of herbal drug **Formative assessment (quiz1)**	**1**	**1**	**-**	**-**	**-**
	Practical session - Checking the purity of crude herbal drugs (extracts) using TLC profiling against a reference	**2**	**-**	**1**	**-**	**-**
5	**Lecture** -Applications of GC in drug evaluation	**1**	**1**	**-**	**-**	**-**
	Practical session - Checking the purity of crude herbal drugs (extracts) using TLC profiling against reference Orientation Activity 2: Quality control of commercially available	**2**	**-**	**1**	***-**	**-**

	pharmaceutical products					
6	**Lecture** - Applications of HPLC and some other chromatographic techniques in drug evaluation	**1**	**1**	**-**	**-**	**-**
	Practical session Chromatography applications (GC and HPLC), central lab visit.	**2**	**-**	**1**	**-**	**-**
7	**Periodical exam**					
8	**Lecture** - Plant biotechnology 1- Plant tissue culture	**1**	**1**	**-**	**-**	**-**
	Practical session - Introduction to plant biotechnology	**2**	**-**	**1**	**-**	**-**
9	**Lecture** Plant Biotechnology 2- Plant Biotransformation	**1**	**1**	**-**	**-**	**-**
	Practical session - Field visit to plant tissue culture lab for demonstration of lab infrastructure and used equipment.	**2**	**-**	**1**	**-**	**-**
10	**Lecture** - Plant Biotechnology 3- Genetic engineering **Formative assessment (quiz 2)**	**1**	**1**	**-**	**-**	**-**
	Practical session -DNA extraction from different plant cells	**2**	**-**	**1**	**-**	**-**
11	**Lecture** - Genetic engineering approaches towards biotransformation - Applications and purposes of plant genetic engineering	**1**	**1**	**-**	**-**	**-**
	Practical session Test for narcotic and poisonous drugs	**2**	**-**	**1**	**-**	**-**

12	**Lecture** - Forensic pharmacognosy -Toxicity of herbal drugs. **Formative assessment (quiz 3)**	**1**	**1**	**-**	**-**	**-**
	Practical exam	**2**	**-**	**1**	**-**	**-**
13	**Lecture** - Narcotic drugs	**1**	**1**	**-**	**-**	**-**
	Practical exam	**2**	**-**	**1**	**-**	**-**
14	**Lecture** -Revision	**1**	**1**	**-**	**-**	**-**
	Practical session Discussion and Assessment of activity	**2**	**-**	**1**	**-***	**-**
15	**Final written exam**					

***** As part of a self-learning activity in Applied and Forensic Pharmacognosy course, a part of practical session in week 2, 5 was specified for the explanation of activity guidelines, rules and assessment rubric. Also, practical sessions in week 14 were facilitated for students to present their reports on the various activity self-learning topics according to the announced student distribution on topics. Supervisors engaged students in a discussion to evaluate the key skills acquired, findings, and conclusions they reached. The activity was formally evaluated against a set of established criteria to ensure a rigorous and consistent assessment.

6-Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Exam 1written (**Mid-term Exam**)	Week 7	10	10%
2	Exam 2 ..... (Semester work)	-	-	-
3	Final Written Exam	Week 15	50	50%
4	Final **Practical**/Clinical/… Exam	Weeks 12 and 13	25	25%
5	Final Oral Exam	Week 15	10	10%

6	Project (**Self-learning Activity**)	Weeks 2,5,14	5	5%
7	Assignment (**Formative assessment**)	Weeks 4,10,12	-	-
8	Other (Mention)	-	-	-

7-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)	Student book and practical notes of "Applied and Forensic Pharmacognosy" approved by Pharmacognosy department 2025-2026.
	Other References	1. Edo, Great Iruoghene, Promise Obasohan, Raghda S. Makia, Tubi Abiola O, Ebuka Chukwuma Umelo, Agatha Ngukuran Jikah, Emad Yousif et al. "The use of quality control parameters in the evaluation of herbal drugs. A review." Discover Medicine 1, no. 1 (2024): 168. 2. Simone Badal and Rupika Delgoda. Pharmacognosy: Fundementals, Applications and Sterategy. Academic Press is an imprint of Elsevier 2017. 3. H. Ranabhatt, R. Kapor: Plant Biotechnology, Woodhead publishing, India, 2018. **4.** -Robards, Kevin, and Danielle Ryan. Principles and practice of modern chromatographic methods. Academic Press, 2021. **5. Edo, Great Iruoghene, Promise Obasohan, Raghda S. Makia, Tubi Abiola O, Ebuka Chukwuma Umelo, Agatha Ngukuran Jikah, Emad Yousif et al. "The use of quality control parameters in the evaluation of herbal drugs. A review." Discover Medicine 1, no. 1 (2024): 168.** **6. Simone Badal and Rupika Delgoda. Pharmacognosy: Fundementals, Applications and Sterategy. Academic Press is an imprint of Elsevier 2017.** **7. H. Ranabhatt, R. Kapor: Plant Biotechnology, Woodhead publishing, India, 2018.** **8. -Robards, Kevin, and Danielle Ryan. Principles and practice of modern**

		chromatographic methods. Academic Press, 2021.
	Electronic Sources (Links must be added)	https://www.ekb.eg/ https://scholar..google.com.eg/ www.Pubmed.Com and www.sciencedirect.com
	Learning Platforms (Links must be added) **Electronic platform of Faculty of Pharmacy- Zagaig University for students**	**https://shorturl.at/sar8D**
	Other (to be mentioned)	-
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	Computer, board, screen
	Supplies	Chemicals and Glassware
	Electronic Programs	1. Microsoft office 2. Microsoft teams
	Skill Labs/ Simulators	plant tissue culture lab central lab
	Virtual Labs	-
	Other (to be mentioned)	-

Name and Signature **Course Coordinator** **Prof. Dr./ Fawkeya Abass**	**Name and Signature** **Head of Department** **Assist. Prof. Dr. Islam Mostafa**

COURSE SPECIFICATIONS

Medicinal chemistry III

Fourth year – semester 7
2025-2026

Course Specification

(2025-2026)

1. Basic Information

Course Title (according to the bylaw)	Medicinal Chemistry III			
Course Code (according to the bylaw)	PC 703			
Department/s participating in delivery of the course	Medicinal chemistry department			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	2 hrs/week	1 hrs/week	-	3 hrs/week
Course Type	Faculty Requirements			
Academic level at which the course is taught	Level 4- semester 7			
Academic Program	Bachelor of Pharmacy (Pharm D)			
Faculty/Institute	Faculty of pharmacy			
University/Academy	Zagazig university			
Name of Course Coordinator	Ass. Prof. Dr. Samar Elbaramawi			
Course Specification Approval Date	18/8/2025			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council			

2. Course Overview (Brief summary of scientific content)

This course enables the student to study various medicinal chemistry aspects of drugs acting on metabolic and endocrine disorders, as well as related agents. The following topics will be addressed: non-steroidal anti-inflammatory drugs, opioid analgesics, local anesthetics, antiallergic agents, hormones and related agents, antidiabetic agents and antiulcer agents .

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**
1.1.1	Demonstrate understanding of knowledge of pharmaceutical, biomedical, social, behavioral, administrative, and clinical sciences.	**1.C1.2.1.**	Identify the chemistry and physicochemical properties of different drug classes (NSAIDs, opioid analgesics, local anesthetics, antiallergic agents, hormones and related agents, antidiabetic agents and antiulcer agents).
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.C1.9.1.**	Describe suitable methods of assay and synthesis of different drug classes (NSAIDs, opioid analgesics, local anesthetics, antiallergic agents, hormones and related agents, antidiabetic agents and antiulcer agents).
1.1.4	Articulate knowledge from fundamental sciences to explain drugs' actions and evaluate their appropriateness, effectiveness, and safety in individuals and populations.	**1.C1.10.1.**	Recognize mode of action and SAR of different drug classes (NSAIDs, opioid analgesics, local anesthetics, antiallergic agents, hormones and related agents, antidiabetic agents and antiulcer agents).
2.2.1	Isolate, design, identify, synthesize, purify, analyze, and standardize synthetic/ natural pharmaceutical materials.	**2.C2.1.1**	Design different synthetic compounds and chemical pathways.
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.C2.5.1**	Implement the appropriate methods for assay of different authentic samples and pharmaceutical preparations.
2.2.4	Adopt the principles of pharmaceutical calculations, biostatistical analysis, bioinformatics, pharmacokinetics, and bio-pharmaceutics and their applications in new drug delivery systems, dose modification, bioequivalence studies, and pharmacy practice.	**2.C2.6.1**	Calculate the concentration of pharmaceutical samples.
		2.C2.7.1	Employ computational methods for designing different compounds and chemical pathways and predicting their chemical properties.

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**
2.3.1	Handle, identify, and dispose biologicals, synthetic/natural materials, biotechnology-based and radio-labeled products, and other materials/products used in pharmaceutical field.	**2.C3.1.1**	Handle chemicals, solvents, and hazardous products properly.
2.3.2	Recognize and adopt ethical, legal, and safety guidelines for handling and disposal of biologicals, and pharmaceutical materials/products.	**2.C3.2.1**	Apply GLP guidelines in handling pharmaceutical preparation and laboratory equipment.
4.1.2	Retrieve and critically analyze information, identify, and solve problems, and work autonomously and effectively in a team.	**4.C1.5.1.**	Demonstrate critical thinking and team-based skills to collaboratively write reports.
4.2.2	Use contemporary technologies and media to demonstrate effective presentation skills.	**4.C2.2.1.**	Demonstrate proficiency in using computational software to design synthetic pathways, integrating visual tools to enhance understanding of reaction mechanisms and structural design.

4. Teaching and Learning Methods

1. Lectures (data show, board)
2. Practical sessions
3. Simulation-based learning (Practical, Activity)
4. Blended learning (Lectures, Practical, Activity)
5. Self-learning (Activity)

5. 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	**Lecture** **Non-steroidal anti-inflammatory agents** -Introduction about inflammation and prostaglandins -Salicylates and P-Aminophenol's -Anthranilic acid derivatives -Aryl acetic derivatives	**2**	**2**	**-**	**-**	**-**
	Practical session ChemDraw ▪ Main ChemDraw Interface ▪ Chemical Structure Drawing ▪ Atom Labeling, Numbering, Captions ▪ Color, Rotation & Frame Addition ▪ Finishing Up Structure ▪ Document Settings	**2**	**-**	**1**	**-**	**-**
2	**Lecture** - Propionic acid derivatives -Oxicams -COX-II Inhibitors -Antigout drugs	**2**	**2**	**-**	**-**	**-**
	Practical session ChemDraw ▪ Conversion of Structure to Name or Smiles & Vice Versa ▪ Copy, Paste & Align Objects	**2**	**-**	**1**	**-**	**-**
3	**Lecture** **Opioid analgesics** -Morphine and semisynthetic antilogs	**2**	**2**	**-**	**-**	**-**
	Practical session ChemDraw ▪ Simple Chemical Reaction Drawing ▪ Finishing Up the Reaction ▪ Chemical Pathway Drawing	**2**	**-**	**1**	**-**	**-**
4	**Lecture** -Narcotic antagonists -Synthetic narcotic analgesics -The most recent synthetic narcotic	**2**	**2**	**-**	**-**	**-**

	analgesic **Formative assessment (quiz 1)**					
	Practical session ChemDraw ▪ ^{1}H & $^{13}CNMR$ Prediction ▪ Analysis Window	**2**	**-**	**1**	**-**	**-**
5	**Lecture** **Local anesthetic drugs.**	**2**	**2**	**-**	**-**	**-**
	Practical session ChemDraw ▪ Chemical Properties Window ▪ Applications **Activity 1**	**2**	**-**	**1**	**-**	**-**
6	**Lecture** **Antiallergenic agents (H_1-antihistaminics)** -First generation antihistaminic -Second generation antihistaminic - Third generation antihistaminic	**2**	**2**	**-**	**-**	**-**
	Practical session Introduction to Spectrophotometry	**2**	**-**	**1**	**-**	**-**
7	**Midterm exam**					
8	**Lecture** **Hormones and related agents** -Types of Hormones -Nomenclature of steroids - Estrogenic & anti-estrogenic agents -Aromatase inhibitor	**2**	**2**	**-**	**-**	**-**
	Practical session Determination of λmax	**2**	**-**	**1**	**-**	**-**
9	**Lecture** -Female sex hormones & oral contraceptives -Androgens& anti-androgenic agents	**2**	**2**	**-**	**-**	**-**
	Practical session - Colorimetric assay of Dexamethasone® ampoule - **Orientation on Activity 2**	**2**	**-**	**1**	**-***	**-**
10	**Lecture** -Anabolic Agents -Mineralocorticoids and glucocorticoids	**2**	**2**	**-**	**-**	**-**

	Practical session - Colorimetric assay of Sodium Salicylate	**2**	**-**	**1**	**-**	**-**
11	**Lecture** **Oral antidiabetic drugs** - First and second-generation sulfonyl urea derivative -No sulfonylurea derivative -Thiazolidindiones	**2**	**2**	**-**	**-**	**-**
	Practical exam	**2**	**-**	**1**	**-**	**-**
12	**Lecture** -Dipeptidyl peptidase inhibitors -Alpha-glucosidase inhibitors -Glucagon-like peptide -1 agonist. -Sodium Glucose co-transporter-2 inhibitors. **Formative assessment (quiz 2)**	**2**	**2**	**-**	**-**	**-**
	Practical exam	**2**	**-**	**1**	**-**	**-**
13	**Lecture** **Antiulcer Drugs** -H_2-antagonists -Proton pump inhibitors -Potassium competitive acid blockers. -Chemical complexation -Prostaglandins antilogs	**2**	**2**	**-**	**-**	**-**
	Practical session Discussion and Assessment of activity	**2**	**-**	**1**	**-***	**-**
14	**Lecture** General discussion and revision	**2**	**2**	**-**	**-**	**-**
	Practical session Discussion and Assessment of activity	**2**	**-**	**1**	**-***	**-**
15	**Final written exam**					

***** As part of a self-learning activity in medicinal chemistry III course, a part of practical session in week 9 was specified for the explanation of activity guidelines, rules and assessment rubric. Also, practical sessions in weeks 13 and 14 were facilitated for students to present their reports on activity self-learning topics according to the announced student distribution on topics. Students were engaged in a discussion to evaluate the key skills acquired, findings, and conclusions they reached. The activity was formally evaluated against a set of established criteria to ensure a rigorous and consistent assessment.

6-Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Exam 1written (**Mid-term Exam**)	Week 7	10	10%
2	Exam 2 ..... (Semester work)	-	-	-
3	Final Written Exam	Week 15	50	50%
4	Final **Practical**/Clinical/… Exam	Weeks 11 and 12	25	25%
5	Final Oral Exam	Week 15	10	10%
6	Project (**Simulation-based Activity**)	Week 5	5	5%
7	Project (**Self-learning Activity**)	Weeks 9, 13 and 14		
8	Assignment (**Formative assessment**)	Weeks 4,12	-	-
9	Other (Mention)	-	-	-

7-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)	Student book and practical notes of "Medicinal Chemistry III" approved by the Medicinal Chemistry Department 2025-2026.
	Other References	1. Wilson CO, Gisvold O, Delgado JN, Remers WA. Wilson and Gisvold's textbook of organic medicinal and pharmaceutical chemistry. 12th ed. Philadelphia: Lippincott-Raven; 2011. 2. Roche VF, Zito SW, Lemke TL, Williams DA, Foye WO. Foye's principles of medicinal chemistry. 8th ed. Philadelphia: Wolters Kluwer Health; 2019. 3. British Pharmacopoeia Commission. British Pharmacopoeia. London: The Stationery Office; 1988–2025. United States Pharmacopeial Convention. 4. United States Pharmacopeia and National Formulary (USP–NF). Rockville (MD): United States Pharmacopeial Convention; 1988–2025. 5. Patrick GL. An Introduction to Medicinal Chemistry. 7th ed. Oxford: Oxford University Press; 2023
	Electronic Sources (Links must be added)	1. https://pubmed.ncbi.nlm.nih.gov 2. http://www.ekb.eg/web

		3. http://journals.tubitak.gov.tr/chem/index.php 4. http://www.pharmacopoeia.co.uk/ 5. https://www.sciencedirect.com
	Learning Platforms (Links must be added) **Electronic platform of Faculty of Pharmacy-Zagazig University for students**	https://phstudent.eps.zu.edu.eg/Views/StudentViews/StudentLogin?fbclid=IwY2xjawL6FF1leHRuA2FlbQIxMABicmlkETE4NnlETkJETktxTE52Rm9nAR6zscxpvbG66rStVoyb6l8uGS6Z03ZZEIUMZ6-Y__tuPx3ubMLmazZAG0U8NQ_aem_gV2eGYHV6OFitgTMHUgIlA
	Other (to be mentioned)	-
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	Computers, Colorimeters, whiteboard, data show
	Supplies	Chemicals and Glassware
	Electronic Programs	1. Microsoft office 2. Microsoft teams 3. ChemDraw application (free trial version)
	Skill Labs/ Simulators	-
	Virtual Labs	Computers labs
	Other (to be mentioned)	-

Name and Signature Course Coordinator	Name and Signature Head of Department
Ass. Prof. Dr. Samar Elbaramawi	**Prof. Dr. Hend Kothayer**

COURSE SPECIFICATIONS

Pharmaceutical Technology I

Fourth year – semester 7
2025-2026

Course Specification

(2025-2026)

1. Basic Information

Course Title (according to the bylaw)	**Pharmaceutical Technology I**			
Course Code (according to the bylaw)	**PT 708**			
Department/s participating in delivery of the course	**Pharmaceutics**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	2 hrs/week	**1 hr/week**	**-**	**3hrs/week**
Course Type	**Faculty requirements**			
Academic level at which the course is taught	**Level 4**			
Academic Program	**Bachelor of Pharmacy (Pharm D)**			
Faculty/Institute	**Pharmacy**			
University/Academy	**Zagazig**			
Name of Course Coordinator	**Shereen sabry**			
Course Specification Approval Date	**8/18/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	**Department council**			

2. Course Overview (Brief summary of scientific content)

The course provides students with an introduction to pharmaceutical technology. It deals with the principles of various unit operations such as heat transfer, evaporation, drying, distillation, filtration, centrifugation, crystallization, extraction, size reduction, size separation, size analysis and size enlargement.

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**
1-1-1	Demonstrate understanding of knowledge of pharmaceutical, biomedical, social, behavioral, administrative, and clinical sciences.	1.C1.2.1	Outline the principles and mechanisms of different pharmaceutical processes including: evaporation, drying, filtration, extraction and crystallization
1-1-7	Identify and critically analyze newly emerging issues influencing pharmaceutical industry and patient health care.	1.C1.16.1	Identify different emerging techniques for evaporation, drying, filtration, extraction, filtration and crystallization.
2-2-1	Isolate, design, identify, synthesize, purify, analyze, and standardize synthetic/ natural pharmaceutical materials.	2.C2.1.1	Choose the appropriate manufacturing equipment based on material properties required for analysis and standardization in different industrial processes
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.C2.4.1	Illustrate the structure of different equipment used in different unit operations with complete description of the principles and techniques , advantages and disadvantages.
4-1-1	Demonstrate responsibility for team performance and peer evaluation of other team members, and express time management skills.	4.C1.1.1	Recognize the value and structure of the pharmacy team and of a multi professional team in solving different problem concerning heat transfer, drying , evaporation
4-1-2	Retrieve and critically analyze information, identify and solve problems, and work autonomously and effectively in a team.	4.C1.5.1	Demonstrate critical thinking, problem-solving and decision-making abilities in a team in suggestion of appropriate apparatus for different pharmaceutical processes such as crystallization, centrifugation, air purification

4. Teaching and Learning Methods

1- Lecture (data show, board)
2. Practical sessions
3. Problem solving (practical)
4. Self-learning (activity)

5. -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	Lecture Evaporation (introduction and mechanism)	2	2	-	-	-
	Practical Problems on evaporation	2	1	-	-	-
2	Lecture Evaporation(equipment)	2	2	-	-	-
	Practical Evaporation apparatus drawings	2	1	-	-	-
3	Lecture Drying (introduction and mechanism)	2	2	-	-	-
	Practical Problems on drying	2	1	-	-	-
4	Lecture Drying(equipment) Formative assessment	2	2	-	-	-
	Drying apparatus drawings	2	1	-	-	-
5	Lecture Heat transfer(introduction and mechanism)	2	2	-	-	-
	Practical Humidity chart	2	1	-	-	-
6	Lecture Heat transfer(equipment)	2	2	-	-	-
	Practical problems on heat transfer	2	1	-	-	-
7	Periodical exam					
8	Lecture Crystallization (introduction and mechanism)	2	2	-	-	-
	Practical Heat transfer apparatus drawings	2	1	-	-	-
9	Lecture	2	2	-	-	-

	Crystallization (equipment)					
	Practical Refrigeration and crystallization apparatus drawings	2	1	-	-	-
10	Lecture Filtration and Centrifugation	2	2	-	-	-
	Practical centrifugation and filtration apparatus drawings+ Activity	2	1	-	-	-
11	Lecture Air purification (introduction, mechanisms and equipment)	2	2	-	-	-
	Practical Air purification apparatus drawings+ Activity	2	1	-	-	-
12	Lecture Refrigeration (Introduction, mechanisms and equipment) Formative assessment	2	2	-	-	-
	Practical Centrifugation apparatus drawings	2	1	-	-	-
13	Lecture Extraction(Introduction, mechanisms and equipment)	2	2	-	-	-
	Practical exam	2	1	-	-	-
14	Lecture Particle size reduction (Introduction, mechanisms and equipment)	2	2	-	-	-
	Practical Discussion and assessment of the activity	2	1	-	-	-
15	Final written exam					

6-Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Exam 1written (periodical)	Week7	10	10%
2	Exam 2 ..... (Semester work)	-	-	-
3	Final Written Exam	Week 15	50	50%
4	Final Practical/Clinical/… Exam	Week 13	25	25%
5	Final Oral Exam	Week 15	10	10%
6	Self-learning activity	Week11	5	5%
7	Assignment (formative exam)	Week4, 12	-	-
8	Other (Mention)	-	-	-

*** The methods mentioned are examples, the organization may add and/or delete**

7-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)	Student book of pharmaceutical technolog-1 approved by Pharmaceutics Department (2025/2026).
	Other References	i- Bentley's text book of Pharmaceutics by Rawlins, E. A., 8th ed (1984). ii- Ansels Pharmaceutical Dosage forms and drug delivery systems 8/ed, Allen , L .V (2005). iii. Hand book of pharmaceutical technology, L.K.Ghosh (2013) iv- Pharmaceutics: The Science of Dosage Form Design by Aulton M.E., (1993). vi- The theory and Practice of Industrial Pharmacy by Leon Lachman, Lieberman, H.A., Kanig, J. L., and Febiger, Philidelphia, USA (1976). vii- Good manufacturing practice for pharmaceuticals, Nally, Joseph.D, Informa Healthcare, (2007). viii. handbook of pharmaceutical technology practical, Pankaj Bhatt (2021)

	Electronic Sources (Links must be added)	www.Pubmed.com www.Sciencedirect.com **www.ekb.eg**
	Learning Platforms (Links must be added)	**https://shorturl.at/sar8D**
	Other (to be mentioned)	-
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	Computer, board
	Supplies	
	Electronic Programs	1. **Microsoft office** 2. **Microsoft teams**
	Skill Labs/ Simulators	
	Virtual Labs	
	Other (to be mentioned)	

*** The list mentioned is an example, the institution may add and/or delete depending on the nature of the course**

Name and Signature **Course Coordinator** **Shereen sabry**	**Name and Signature** **Head of department** **Shereen sabry**

COURSE SPECIFICATIONS

Medical Microbiology

Fourth year – semester 7
2025-2026

Course Specification

(2025-2026)

1. Basic Information

Course Title (according to the bylaw)	Medical microbiology			
Course Code (according to the bylaw)	PM 704			
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 hrs/week	1 hrs/week	-	3 hrs/week
Course Type	Faculty Requirements			
Academic level at which the course is taught	Level 4- semester 7			
Academic Program	Bachelor of Pharmacy (Pharm D) general program			
Faculty/Institute	Faculty of pharmacy			
University/Academy	Zagazig university			
Name of Course Coordinator	Prof.Dr. Nehal Elsayed Youssef			
Course Specification Approval Date	18/8/2025			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council			

2. Course Overview (Brief summary of scientific content)

On completion of the course, the student will be able to:

1. Illustrate the etiology, pathogenesis, clinical picture, laboratory diagnosis as well as therapeutic regimen of different bacterial, fungal and viral diseases
2. Perform the diagnostic laboratory tests for identification of the infectious agents.

3. Specify the appropriate vaccination, treatment and preventive measures for each infectious agent.
4. Develop the critical thinking skills and communicate efficiently with patients and health care professionals.

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**
1.1.1	Demonstrate understanding of knowledge of pharmaceutical, biomedical, social, behavioral, administrative, and clinical sciences.	**1.C1.3.1.**	Explain the principles of medical microbiology, gram positive bacteria, gram negative bacteria, and mycology.
1.1.2	Utilize the proper pharmaceutical and medical terms, abbreviations and symbols in pharmacy practice.	**1.C1.8.1.**	Use the proper pharmaceutical, medical terms, abbreviations and symbols in pharmacy practice.
3.1.3	Monitor and control microbial growth and carry out laboratory tests for identification of infections/ diseases.	**3.C1.4.1.**	Select the appropriate medication therapy for a given disease caused by certain organism after identification based on clinical features and laboratory diagnosis.
3.1.4	Relate etiology, epidemiology, pathophysiology, laboratory diagnosis, and clinical features of infections/diseases and their pharmacotherapeutics.	**3.C1.7.1**	Determining the efficacy of the selected drug therapy based on the patient follow up.
4.2.2	Use contemporary technologies and media to demonstrate effective Presentation skills.	**4.C2.2.1.**	Demonstrate good information skills as well as presentation skills.

4-Teaching and Learning Methods

1. Lectures (data show, board)
2. Practical sessions
3. Self-learning and presentations

5-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	**Lecture** - Introduction to medical microbiology Host-Parasite relationship -GRAM-POSITIVE COCCI -Genus Staphylococcus - Genus Streptococci: β- hemolytic streptococci	**2**	**2**	**-**	**-**	**-**
	Practical session - Laboratory safety measures	**2**	**-**	**1**	**-**	**-**
2	**Lecture** Genus Streptococci α- hemolytic streptococci γ- hemolytic streptococci -GRAM-POSITIVE NON-SPORE FORMING RODS: *Corynebacterium and Listeria* -GRAM-POSITIVE SPORE-FORMING RODS: *Bacillus and Clostridium*	**2**	**2**	**-**	**-**	**-**
	Practical session Genus *Staphylococcus*: *-Staph. aureus* *-Staph. epidermidis* *-Staph. saprophyticus*	**2**	**-**	**1**	**-**	**-**
3	**Lecture** • GRAM-POSITIVE NON-SPORE FORMING RODS: *Corynebacterium and Listeria* • GRAM-POSITIVE SPORE-FORMING RODS: *Bacillus and Clostridium*	**2**	**2**	**-**	**-**	**-**
	Practical session β- hemolytic streptococci: *- Strept. pyogenes* *- Strept. agalactiae*	**2**	**-**	**1**	**-**	**-**
4	**Lecture** ACID-FAST BACILLI: *Mycobacteriae* CELL-WALL DEFICIENT BACTERIA: *Mycoplasma*	**2**	**2**	**-**	**-**	**-**

	Practical session α- hemolytic streptococci *- Strept. pneumoniae* *- Strept. viridans*	**2**	**-**	**1**	**-**	**-**
5	**Lecture** • OBLIGATE INTRACELLULAR BACTERIA: *Spirochetes, Rickettsiae and Chlamydiae* • GRAM-NEGATIVE COCCI: *Neisseria and Branhamella*	**2**	**2**	**-**	**-**	**-**
	Practical session **:** γ- hemolytic streptococci*Enterococci* *- Non- enterococci*	**2**	**-**	**1**	**-**	**-**
6	**Lecture** FERMENTATIVE GRAM-NEGATIVE RODS -Family Enterobacteriaceae: -Lactose Non-Fermenters: *Salmonella, Shigella, Proteus and Serratia* - Lactose Non-Fermenters: *Yersinia* - NON-FERMENTATIVE: GRAM-NEGATIVE RODS (OXIDATIVE GROUP): *Pseudomonas and Acinetobacter*	**2**	**2**	**-**	**-**	**-**
	Practical session Gm +ve bacilli: *- Bacillus anthracis* *- Listeria monocytogenes* *Corynebacterium diphtheria*	**2**	**-**	**1**	**-**	**-**
7	**Periodical exam**					
8	**Lecture** • FERMENTATIVE GRAM-NEGATIVE RODS -Family Enterobacteriaceae: -Lactose Non-Fermenters: *Salmonella, Shigella, Proteus & Serratia*	**2**	**2**	**-**	**-**	**-**
	Practical session • Enterobacteriaceae - Lactose fermenters: *- Escherichia coli* *- Citrobacter spp*	**2**	**-**	**1**	**-**	**-**
9	**Lecture** • Lactose Non-Fermenters: *Yersinia* • NON-FERMENTATIVE:GRAM-NEGATIVE RODS (OXIDATIVE GROUP): *Pseudomonas and Acinetobacter*	**2**	**2**	**-**	**-**	**-**
	Practical session Enterobacteriaceae	**2**	**-**	**1**	**-**	**-**

	- Lactose fermenters: *Klebsiella pneumoniae* *Enterobacter spp*					
10	**Lecture** • CURVED GRAM-NEGATIVE RODS *Vibrio, Campylobacter and Helicobacter* • GRAM-NEGATIVE UNUSUAL BACTERIA (RODS): *Haemophilus, Bordetella and Legionella*	**2**	**2**	**-**	**-**	**-**
	Practical session • - Enterobacteriaceae -Lactose non-fermenters: - Genus *Salmonella* - Genus *Shigella*	**2**	**-**	**1**	**-***	**-**
11	**Lecture** • MISCELLANEOUS FASTIDIOUS GRAM-NEGATIVE RODS: *Brucella and Pasteurella* • OBLIGATE ANAEROBIC GRAM-NEGATIVE BACTERIA: *Bacteroides and Fusobacterium*	**2**	**2**	**-**	**-**	**-**
	Practical session • Enterobacteriaceae - Lactose non- fermenters: - Genus *Proteus* - Genus *Serratia*	**2**	**-**	**1**	**-**	**-**
12	**Lecture** **Mycology**: Importance of fungi Morphology and reproduction of fungi **Pathogenic fungi:** Superficial, Subcutaneous, Systemic and Opportunistic mycotic infections.	**2**	**2**	**-**	**-**	**-**
	Practical session • Oxidative Gram–ve rods: - Genus *Pseudomonas* - Genus *Acinetobacter*	**2**	**-**	**1**	**-**	**-**
13	**Lecture** - Final revesion	**2**	**2**	**-**	**-**	**-**
	Practical exam	**2**	**-**	**1**	**-***	**-**
14	**Lecture** student presentation	**2**	**2**	**-**	**-**	**-**
15	**Final written exam**					

6-Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Exam 1written (**Mid-term Exam**)	Week 8	10	10%
2	Exam 2 ..... (Semester work)	-	-	-
3	Final Written Exam	Week 15	50	50%
4	Final **Practical**… Exam	Weeks 13	25	25%
5	Final Oral Exam	Week 15	10	10%
6	Project (**Self-learning Activity**)	Weeks 14	5	5%

7. 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)	Student book and practical notes of "Medical microbiology" approved by the microbiology department 2025-2026.
	Other References	1. Patrick R. Murray, Ken S. Rosenthal, Michael A. Pfaller. Medical Microbiology, 7th ed. (Philadelphia: Elsevier/Mosby, 2012). 2. Levinson, W. Review of Medical Microbiology and Immunology, 13th ed. LANGE REVIEW SERIES (NY: McGraw-Hill, 2014). 3. Brooks, G.F.; Carroll, K. C.; Butel, J.S.; Morse, S. A. (2007): Jawetz, Melnick and Adelberg's Medical Microbiology. 24th ed. McGraw-Hill. 4. Infectious Disease: A Clinical Short Course by F.S. Southwick, McGraw-Hill, 3rd edition, 2013.
	Electronic Sources (Links must be added)	Egyptian J. of Microbiology. Arab J. of Laboratory Medicine American journal of microbiology www.Pubmed.Com www.sciencedirect.com
	Learning Platforms	**https://shorturl.at/sar8D**

	(Links must be added) **Electronic platform of Faculty of Pharmacy- Zagaig University for students**	
	Other (to be mentioned)	-
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	Black (white) boards, overhead projectors and data show.
	Supplies	Chemicals, Autoclaves, Incubators, Ovens, Water bathes, staining dyes, microscopes, refrigerators and microbiological culture media
	Electronic Programs	1. Microsoft office 2. Microsoft teams
	Skill Labs/ Simulators	-
	Virtual Labs	-
	Other (to be mentioned)	-

Name and Signature
Course Coordinator
Prof.Dr. Nehal Elsayed Youssef

Name and Signature
Head of Department
Ass. Prof. Momen Askoura

Semester 8

COURSE SPECIFICATIONS

Clinical Pharmacokinetics

Fourth year – semester 8
2025-2026

Course Specification

(2025-2026)

1. Basic Information

Course Title (according to the bylaw)	Clinical pharmacokinetics			
Course Code (according to the bylaw)	PP 801			
Department/s participating in delivery of the course	Pharmacy practice			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	2 hrs./week	1 hr./week	-	3 hrs./week
Course Type	Faculty Requirements			
Academic level at which the course is taught	Level 4 - semester 8			
Academic Program	Bachelor of Pharmacy (Pharm D)			
Faculty/Institute	Faculty of pharmacy			
University/Academy	Zagazig university			
Name of Course Coordinator	Prof. Dr. Hanan El-Nahas			
Course Specification Approval Date	**25/8/2025**			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Council of Quality assurance unit			

2. Course Overview (Brief summary of scientific content)

On completion of the course, Students will be able to define clinical pharmacokinetics, linear and nonlinear pharmacokinetics, drug distribution and drug clearance mechanisms as well as concentration monitoring and application of pharmacokinetics in clinical situations. Students will be able to individualize drug therapy for drugs with narrow therapeutic index such as aminoglycosides, lithium, phenytoin, and others.

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**
1.1.1	Demonstrate understanding of knowledge of pharmaceutical, biomedical, social, behavioral, administrative, and clinical sciences.	1.C1.7.1	Illustrate various terms related to clinical pharmacokinetics including linear and nonlinear pharmacokinetics, clearance, volume of distribution, drug elimination, bioavailability, bioequivalence, and concentration monitoring, drug dosing in special population
1.1.4	Articulate knowledge from fundamental sciences to explain drugs' action and evaluate their appropriateness, effectiveness, and safety in individuals and populations	1.C1.11.1	Illustrate the principles of clinical pharmacokinetics to design individualized dosage regimen to achieve best patient outcome.
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, pharmacy practice.	2.C2.6.1	Calculate patient-specific parameters including creatinine clearance, volume of distribution and dose using different dose methods such as Pk dosing, and literature-based methods.

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.C2.8.1	Apply the principles of pharmacokinetics to calculate the required dose and select an appropriate dosage regimen and to conduct bioequivalence studies and formulate a new safe, and effective delivery system according to the patient status.
4.1.2	Retrieve and critically analyze information, identify, and solve problems, and work autonomously and effectively in a team.	4.C1.5.1	Collaborate with other healthcare professionals to identify clinical problem and design a management plan.

4. Teaching and Learning Methods

1. Lectures (data show, board)
2. Practical sessions (case study)
3. Self- learning (Activity)

5. 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	**Lecture** Basic concepts: • Linear & nonlinear pharmacokinetics • Clearance	**2**	**2**	**-**	**-**	**-**
	Practical session Calculate: part 1 • Clearance • Elimination half-life • Bioavailability	**2**	**-**	**1**	**-**	**-**
2	**Lecture** Basic concepts: • Volume of distribution • Bioavailability	**2**	**2**	**-**	**-**	**-**
	Practical session Calculate: part 2 • Clearance • Elimination half-life • Bioavailability	**2**	**-**	**1**	**-**	**-**
3	**Lecture** Drug dosing in special populations: renal and hepatic disease • Dialysis • Heart failure	**2**	**2**	**-**	**-**	**-**
	Practical session Calculate: part 1 • reatinine clearance • Child Pugh score	**2**	**-**	**1**	**-**	**-**
4	**Lecture** Drug dosing in special populations: renal and hepatic disease	**2**	**2**	**-**	**-**	**-**

	• Obesity • Drug interactions -**Formative assessment (quiz1)**					
	Practical session Calculate: part 2 • reatinine clearance • Child Pugh score	**2**	**-**	**1**	**-**	**-**
5	**Lecture** Aminoglycosides clinical pharmacokinetics	**2**	**2**	**-**	**-**	**-**
	Practical session TDM of aminoglycosides part 1	**2**	**-**	**1**	**-**	**-**
6	**Lecture** Digoxin clinical pharmacokinetics	**2**	**2**	**-**	**-**	**-**
	Practical session TDM of aminoglycosides part 2	**2**	**-**	**1**	**-**	**-**
7	**Lecture** Phenytoin clinical pharmacokinetics	**2**	**2**	**-**	**-**	**-**
	Practical session TDM of digoxin	**2**	**-**	**1**	**-**	**-**
8	**Midterm exam**					
9	**Lecture** Lithium clinical pharmacokinetics	**2**	**2**	**-**	**-**	**-**
	Practical session TDM of phenytoin	**2**	**-**	**1**	**-**	**-**
10	**Lecture** Nifedipine Serum Concentration; Effects upon blood pressure and heart rate in normotensive volunteers **Formative assessment (quiz 2)**	**2**	**2**	**-**	**-**	**-**
	TDM of lithium	**2**	**-**	**1**	**-**	**-**
11	**Lecture** The duration of action of pindolol and its relation to plasma levels	**2**	**2**	**-**	**-**	**-**
	Practical TDM of theophylline	**2**	**-**	**1**	**-**	**-**

12	**Lecture** Influence of inflammatory disease on the clinical pharmacokinetics of atenolol and metoprolol **Formative assessment (quiz 3)**	**2**	**2**	**-**	**-**	**-**
	TDM of phenobarbital	**2**	**-**	**1**	**-***	**-**
13	**Lecture** Plasma profiles following single, oral, and rectal doses of phenylbutazone in healthy volunteers	**2**	**2**	**-**	**-**	**-**
	Practical exam	**2**	**-**	**1**	**-**	**-**
14	**Lecture** General discussion and revision	**2**	**2**	**-**	**-**	**-**
	Practical session Discussion and Assessment of activity	**2**	**-**	**1**	**-***	**-**
15	**Final written exam**					

***** As part of a self-learning activity in Clinical pharmacokinetics course, a part of practical session in week 12 was specified for the explanation of activity guidelines, rules and assessment rubric. Also, practical sessions in week 14 were facilitated for students to present their reports on the various activity self-learning topics according to the announced student distribution on topics. Supervisors engaged students in a discussion to evaluate the key skills acquired, findings, and conclusions they reached. The activity was formally evaluated against a set of established criteria to ensure a rigorous and consistent assessment.

6. Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Exam 1written (**Mid-term Exam**)	Week 8	10	10%
2	Exam 2 ..... (Semester work)	-	-	-
3	Final Written Exam	Week 15	50	50%
4	Final **Practical**/Clinical/… Exam	Weeks 12	25	25%
5	Final Oral Exam	Week 15	10	10%
6	Project (**Self-learning Activity**)	Week 14	5	5%
7	Assignment (**Formative assessment**)	Weeks 4,10,12	-	-

8	Other (Mention)	-	-	-

7. 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)	1. Student book of Clinical Pharmacokinetics approved by Pharmacy practice department (2025-2026) 2. Winter, Michael E., editor. Basic Clinical Pharmacokinetics. 5th ed., Lippincott Williams & Wilkins, a Wolters Kluwer business, 2009. 3. Bauer, Larry A. Applied Clinical Pharmacokinetics. 3rd ed., McGraw-Hill Education, 2014.
	Other References	1. Murphy, J. E. (Ed.). Clinical pharmacokinetics 7th ed., American Society of Health-System Pharmacists, 2022. 2. Beringer, Paul M. Winter's Basic Clinical Pharmacokinetics. 6th ed., Lippincott Williams & Wilkins, a Wolters Kluwer business, 2017.
	Electronic Sources (Links must be added)	https://www.ekb.eg/ www.Pubmed.Com www.sciencedirect.com www.mdcalc.com www.medscape.com www.globalrph.com
	Learning Platforms (Links must be added) **Electronic platform of Faculty of Pharmacy- Zagaig University for students**	**https://shorturl.at/sar8D**
	Other (to be mentioned)	-

Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	Computer, board, Conductometer
	Supplies	--
	Electronic Programs	1. Microsoft office 2. Microsoft teams
	Skill Labs/ Simulators	-
	Virtual Labs	-
	Other (to be mentioned)	-

Name and Signature **Course Coordinator**	**Name and Signature** **Head of Department**
Prof. Dr. Hanan El-Nahas	Ass.prof.. Esraa Zakria

COURSE SPECIFICATIONS
Drug Design
Fourth year – semester 8
2025-2026

Course Specification

(2025-2026)

1. Basic Information

Course Title (according to the bylaw)	Drug Design			
Course Code (according to the bylaw)	PC 804			
Department/s participating in delivery of the course	Medicinal chemistry department			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	1 hrs/week	1 hrs/week	-	2 hrs/week
Course Type	Faculty Requirements			
Academic level at which the course is taught	Level 4- semester 8			
Academic Program	Bachelor of Pharmacy (Pharm D)			
Faculty/Institute	Faculty of pharmacy			
University/Academy	Zagazig university			
Name of Course Coordinator				
Course Specification Approval Date	18/8/2025			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council			

2. Course Overview (Brief summary of scientific content)

This course aims to provide students with basic knowledge of the process of drug discovery and development from the identification of new target macromolecules to the introduction of new chemical entities into the drug market. The following topics will be addressed: lead identification, lead optimization, and drug action at receptors. Drug action on enzymes, prodrug design and applications, as well as structure-based and computer-aided drug design methods. Also, drug metabolism and quantitative structure activity relationship (QSAR).

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**
1.1.1	Demonstrate understanding of knowledge of pharmaceutical, biomedical, social, behavioral, administrative, and clinical sciences.	**1.C1.2.1.**	Identify the concepts of drug discovery, drug development, drug targets, bioisosterism, Prodrugs, drug metabolism, Drug-receptor interactions, CADD, and QSAR.
1.1.2	Utilize the proper pharmaceutical and medical terms, abbreviations and symbols in pharmacy practice.	**1.C1.8.1.**	Utilize accurate terms and abbreviations relevant to drug discovery and development processes, including target identification, lead optimization, drug-receptor interactions, prodrugs strategies, metabolism, CADD, and QSAR.
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.C1.9.1.**	Use pharmaceutical principles to guide the design, development, and evaluation of drug molecules, focusing on targets, prodrugs, metabolism, structure-activity relationships, and computational approaches.
2.2.1	Isolate, design, identify, synthesize, purify, analyze, and standardize synthetic/ natural pharmaceutical materials.	**2.C2.1.1**	Design compounds and identify possible binding interactions within their targets.

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**
2.2.4	Adopt the principles of pharmaceutical calculations, biostatistical analysis, bioinformatics, pharmacokinetics, and bio-pharmaceutics and their applications in new drug delivery systems, dose modification, bioequivalence studies, and pharmacy practice.	**2.C2.7.1**	Employ computational methods for molecular modeling to interpret protein-ligand interactions in 2D and 3D poses.
4.1.2	Retrieve and critically analyze information, identify, and solve problems, and work autonomously and effectively in a team.	**4.C1.4.1**	Retrieve and critically assess information from scientific literature, databases, and digital resources related to drug discovery.
		4.C1.5.1.	Demonstrate critical thinking ability to interpret the optimal binding pose of ligands within their targets and identify various binding interactions.
4.2.2	Use contemporary technologies and media to demonstrate effective presentation skills.	**4.C2.2.1.**	Demonstrate proficiency in using modeling software to discuss insights from molecular docking simulations and protein-drug interactions.

4. Teaching and Learning Methods

1. Lectures (data show, board)
2. Practical sessions
3. Simulation-based learning (Practical, Activity)
4. Blended-learning (Lectures, Practical, Activity)
5. Self-learning (Activity)

5. 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	**Lecture** -Drug discovery, drug development, drug targets, identifying a bioassay, lead identification	**1**	**1**	**-**	**-**	**-**
	Practical session Introduction to drug design	**2**	**-**	**1**	**-**	**-**
2	**Lecture** - Lead optimization	**1**	**1**	**-**	**-**	**-**
	Practical session Introduction to Molecular Operating Environment (MOE) Molecules Building and minimization	**2**	**-**	**1**	**-**	**-**
3	**Lecture** - Lead optimization - Drug-receptor interactions - Forces involved in drug receptor interaction.	**1**	**1**	**-**	**-**	**-**
	Practical session MOE: Steric measurements	**2**	**-**	**1**	**-**	**-**
4	**Lecture** -Nucleic acid as drug target and miscellaneous drug targets. **Formative assessment (quiz 1)**	**1**	**1**	**-**	**-**	**-**
	Practical session MOE: Ligand Preparation MOE: Database Creation	**2**	**-**	**1**	**-**	**-**
5	**Lecture** - Quantitative structure-activity relationships - Electronic effects (σ), Hansch equation - The Craig plot, The Topliss scheme	**1**	**1**	**-**	**-**	**-**
	Practical session MOE: Protein Preparation	**2**	**-**	**1**	**-**	**-**
6	**Lecture** - Combinatorial synthesis and computer-aided drug design.	**1**	**1**	**-**	**-**	**-**

	Practical session MOE: Docking Process and Results Interpretation	**2**	**-**	**1**	**-**	**-**
7	**Lecture** -Application of drug development strategy in discovering new drugs.	**1**	**1**	**-**	**-**	**-**
	Practical session MOE: Docking Process and Results Interpretation **Activity 1**	**2**	**-**	**1**	**-**	**-**
8	**Midterm exam**					
9	**Lecture** -Application of drug development strategy in discovering new drugs (i.e.H2-blockers and cox-2 inhibitors -Bioisosterism.	**1**	**1**	**-**	**-**	**-**
	Practical session MOE: Docking Process and Results Interpretation **Activity 2**	**2**	**-**	**1**	**-**	**-**
10	**Lecture** -Receptor as drug target.	**1**	**1**	**-**	**-**	**-**
	Practical session - Ligand Surface Mapping -Flexible Alignment **Orientation on Activity 3**	**2**	**-**	**1**	**-***	**-**
11	**Lecture** - Prodrugs and drug latentiation Bioprecursor prodrugs, chemical delivery systems.	**1**	**1**	**-**	**-**	**-**
	Practical exam	**2**	**-**	**1**	**-**	**-**
12	**Lecture** - Drug metabolism **Formative assessment (quiz 2)**	**1**	**1**	**-**	**-**	**-**
	Practical exam	**2**	**-**	**1**	**-**	**-**
13	**Lecture** -Enzyme as drug target	**1**	**1**	**-**	**-**	**-**
	Practical session Discussion and Assessment of activity	**2**	**-**	**1**	**-***	**-**
14	**Lecture** General discussion and revision	**1**	**1**	**-**	**-**	**-**
	Practical session Discussion and Assessment of activity	**2**	**-**	**1**	**-***	**-**
15	**Final written exam**					

***** As part of a self-learning activity in Drug Design course, a part of practical session in week 10 was specified for the explanation of activity guidelines, rules and assessment rubric. Also, practical sessions in weeks 13 and 14 were facilitated for students to present their reports on activity self-learning topics according to the announced student distribution on topics. Students were engaged in a discussion to evaluate the key skills acquired, findings, and conclusions they reached. The activity was formally evaluated against a set of established criteria to ensure a rigorous and consistent assessment.

6-Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Exam 1written (**Mid-term Exam**)	Week 8	10	10%
2	Exam 2 ..... (Semester work)	-	-	-
3	Final Written Exam	Week 15	50	50%
4	Final **Practical**/Clinical/… Exam	Weeks 11 and 12	25	25%
5	Final Oral Exam	Week 15	10	10%
6	Project (**Simulation-based Activity**)	Weeks 7 and 9	5	5%
7	Project (**Self-learning Activity**)	Weeks 10, 13 and 14		
8	Assignment (**Formative assessment**)	Weeks 4,12	-	-
9	Other (Mention)	-	-	-

7-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)	Student book and practical notes of "Drug Design" approved by the Medicinal Chemistry Department 2025-2026.
	Other References	1. Richard B. Silverman and Mark W. Holladay. The Organic Chemistry of Drug Design and Drug Action 3rd ed.; 2014. 2. Wilson CO, Gisvold O, Delgado JN, Remers WA. Wilson and Gisvold's textbook of organic medicinal and pharmaceutical chemistry. 12th ed. Philadelphia: Lippincott-Raven; 2011. 3. Roche VF, Zito SW, Lemke TL, Williams DA, Foye WO. Foye's principles of medicinal chemistry. 8th ed. Philadelphia: Wolters Kluwer Health; 2019. 4. British Pharmacopoeia Commission. British Pharmacopoeia.

		London: The Stationery Office; 1988–2025. United States Pharmacopeial Convention. 5. United States Pharmacopeia and National Formulary (USP–NF). Rockville (MD): United States Pharmacopeial Convention; 1988–2025. 6. Patrick GL. An Introduction to Medicinal Chemistry. 7th ed. Oxford: Oxford University Press; 2023
	Electronic Sources (Links must be added)	1. http://www.rcsb.org 2. http://www.ncbi.nlm.nih.gov/sites/entrez 3. http://www.ekb.eg 4. http://journals.tubitak.gov.tr/chem/index.php 5. http://www.pharmacopoeia.co.uk/ 6. www.Pubmed.Com 7. www.sciencedirect.com
	Learning Platforms (Links must be added) **Electronic platform of Faculty of Pharmacy- Zagaig University for students**	https://phstudent.eps.zu.edu.eg/Views/StudentViews/StudentLogin?fbclid=IwY2xjawL6FF1leHRuA2FlbQIxMABicmlkETE4NnlETkJETktxTE52Rm9nAR6zscxpvbG66rStVoyb6l8uGS6Z03ZZEIUMZ6-Y__tuPx3ubMLmazZAG0U8NQ_aem_gV2eGYHV6OFitgTMHUgIlA
	Other (to be mentioned)	-
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	Computers, whiteboard, data show
	Supplies	-
	Electronic Programs	1. Microsoft office 2. Microsoft teams 3. Docking program (trial)
	Skill Labs/ Simulators	-
	Virtual Labs	Computers labs
	Other (to be mentioned)	-

Name and Signature **Course Coordinator**	**Name and Signature** **Head of Department** **Prof. Dr. Hend Kothayer**

COURSE SPECIFICATIONS

Basic & Clinical Toxicology

Fourth year – semester 8
2025-2026

Course Specification

(2025-2026)

1. Basic Information

Course Title (according to the bylaw)	Basic & Clinical Toxicology			
Course Code (according to the bylaw)	PO 805			
Department/s participating in delivery of the course	Pharmacology and Toxicology Department			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	2 hrs/week	1 hr/week	-	3 hrs/week
Course Type	Faculty Requirements			
Academic level at which the course is taught	Level 4- semester 8			
Academic Program	Bachelor of Pharmacy (Pharm D)			
Faculty/Institute	Faculty of Pharmacy			
University/Academy	Zagazig university			
Name of Course Coordinator	Prof.Dr.			
Course Specification Approval Date	18/8/2025			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council			

2. Course Overview (Brief summary of scientific content)

On completion of the course, the student will be able to understand toxic substances, their mechanisms of action, target organ toxicity, and clinical management. Recognize the signs, symptoms, and health risks associated with exposure to various toxic substances such as heavy metals, gases, natural poisons, pesticides, and radiation. Describe the principles of reproductive and genetic toxicology and detect toxic agents,

and interpret analytical results in a forensic context. The students will be prepared for professional roles in clinical, forensic, and public health contexts.

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**
1.1.1	Demonstrate understanding and knowledge of pharmaceutical, biomedical, social, behavioral, administrative, and clinical sciences.	**1.C1.6.1**	Define key concepts related to toxicology, including classifications, mechanisms of toxicity, and target organ effects and management of toxicity.
		1.C1.6.2	Recognize the signs, symptoms, and health risks associated with exposure to various toxic substances.
		1.C1.6.3	Describe the principles of radiation, reproductive, and genetic toxicology.
		1.C1.6.4	Define the role and principles of forensic toxicology in the investigation of poisoning cases, including types of biological samples used, methods of detection, and legal implications.
2.2.1	Isolate, design, identify, synthesize, purify, analyze, and standardize synthetic/ natural pharmaceutical materials.	**2.C2.1.1**	Use laboratory tools to detect toxic agents and interpret analytical results in a forensic context.
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.C2.5.1**	Demonstrate appropriate methods for the analysis of poisons.
2.3.1	Handle, identify, and dispose of biologicals, synthetic/natural materials, biotechnology-based and radio-labeled products, and other materials/product used in the pharmaceutical field.	**2.C3.1.1**	Handle and dispose of chemicals safely

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**
2.3.2	Recognize and adopt ethical, legal, and safety guidelines for handling and disposal of biologicals, and pharmaceutical materials/products.	**٢.C3.2.1**	Apply GLP guidelines for safe handling and disposal of pharmaceutical materials and products.
2.4.1	Ensure safe handling/ use of poisons to avoid their harm to individuals and communities.	**٢.C4.1.1**	Demonstrate the ability to advise patients and healthcare professionals on the safe handling, use, and potential risks of medicines and poisons and management of toxicity.
2.4.4	Assess toxicity profiles of different xenobiotics and detect poisons in biological specimens.	**2.C4.4.1**	Interpret toxicological data to assess the severity and mechanism of toxicity.
		2.C4.5.1	Evaluate the toxic effects of substances using biological samples and laboratory techniques.
3.2.4	Provide information about toxic profiles of drugs and other xenobiotics including sources, identification, symptoms, and management control.	**3.C2.4.1**	Educate patients and the community about toxic profiles of drugs and other toxic substances, e.g. metals, animal and food poisons, pesticides, and radiation.
3.2.6	Maintain public awareness on social health hazards of drug misuse and abuse.	**3.C2.6.1**	Advise patients and healthcare providers on the safe use and risks of drugs.
4.2.2	Use contemporary technologies and media to demonstrate effective presentation skills.	**4.C2.2.1**	Demonstrate effective IT and presentation skills.

4. Teaching and Learning Methods

1) Lectures (data show, board)
2) Practical sessions
3) Self-learning (Activity)
4) Problem-Based Learning (Practical)
5) Case-Based Learning (Practical)

5. 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	**Lecture** - Introduction to Toxicology - Mechanisms of cellular injury	**2**	**2**	**-**	**-**	**-**
	Practical session General lab safety guidelines Handle and dispose of chemicals safely	**2**	**-**	**1**	**-**	**-**
2	**Lecture** -Animal poisons -Food poisoning	**2**	**2**	**-**	**-**	**-**
	Practical session Introduction to management of toxicity	**2**	**-**	**1**	**-**	**-**
3	**Lecture** Target organ toxicity: - Blood - Immune system - Nervous system	**2**	**2**	**-**	**-**	**-**
	Practical session Tissue spots	**2**	**-**	**1**	**-**	**-**
4	**Lecture** Target organ toxicity: - Visual system - Liver - Kidney **Formative assessment (quiz1)**	**2**	**2**	**-**	**-**	**-**
	Practical session Blood spots	**2**	**-**	**1**	**-**	**-**
5	**Lecture** Target organ toxicity: - Respiratory system - Cardiovascular system	**2**	**2**	**-**	**-**	**-**
	Practical session Case studies (1): Blood & Immune system Respiratory & visual system	**2**	**-**	**1**	**-**	**-**
6	**Lecture** - Toxic Effects of Radiation - Ecotoxicology - Genetic toxicology	**2**	**2**	**-**	**-**	**-**

	Practical session Case studies (2): Nervous & cardiovascular system Liver & kidney	**2**	**-**	**1**	**-**	**-**
7	**Midterm exam**					
8	**Lecture** Toxic effects of metals **Formative assessment (quiz 2)**	**2**	**2**	**-**	**-**	**-**
	Practical session Forensic toxicology (paracetamol, imipramine, salicylate, nicotine, ethanol, methanol, acetone, quinine)	**2**	**-**	**1**	**-**	**-**
9	**Lecture** Prevention and treatment of poisoning (Part I)	**2**	**2**	**-**	**-**	**-**
	Practical session Forensic toxicology (chemical tests of paracetamol, imipramine, salicylate, nicotine, ethanol, methanol, acetone, quinine)	**2**	**-**	**1**	**-**	**-**
10	**Lecture** Prevention and treatment of poisoning (Part II)	**2**	**2**	**-**	**-**	**-**
	Practical session - Case studies (3): Metals – Gases. - Orientation on Activity	**2**	**-**	**1**	**-***	**-**
11	**Lecture** Forensic chemistry of biological stains and hair	**2**	**2**	**-**	**-**	**-**
	Case studies (4): Animal, plant and marine poisons – Pesticides	**2**	**-**	**1**	**-**	**-**
12	**Lecture** Toxic effects of pesticides **Formative assessment (quiz 3)**	**2**	**2**	**-**	**-**	**-**
	Practical exam	**2**	**-**	**1**	**-**	**-**
13	**Lecture** Drug abuse	**2**	**2**	**-**	**-**	**-**
	Practical session Discussion and Assessment of activity	**2**	**-**	**1**	**-***	**-**
14	**Lecture** General discussion and revision	**2**	**2**	**-**	**-**	**-**
	Practical session Discussion and Assessment of	**2**	**-**	**1**	**-***	**-**

	activity					
15	**Final written exam**					

***** As part of a self-learning activity in basic and clinical toxicology course, a part of practical session in week 10 was specified for the explanation of activity guidelines, rules and assessment rubric. Also, practical sessions in weeks 13 and 14 were facilitated for students to present their reports on the various activity self-learning topics according to the announced student distribution on topics. Supervisors engaged students in a discussion to evaluate the key skills acquired, findings, and conclusions they reached. The activity was formally evaluated against a set of established criteria to ensure a rigorous and consistent assessment.

6-Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Exam 1written (**Mid-term Exam**)	Week 7	10	10%
2	Exam 2 ..... (Semester work)	-	-	-
3	Final Written Exam	Week 15	50	50%
4	Final **Practical**/Clinical/… Exam	Weeks 11 and 12	25	25%
5	Final Oral Exam	Week 15	10	10%
6	Project (**Self-learning Activity**)	Weeks 10,13,14	5	5%
7	Assignment (**Formative assessment**)	Weeks 4,8,12	-	-
8	Other (Mention)	-	-	-

7-Learning Resources and Supportive Facilities *

Learning resources (books, scientific references,	**The main (essential) reference for the course**	Student book and practical notes of "Basic and Clinical Toxicology" approved by the Pharmacology and Toxicology department 2025-2026.

etc.) *	**Other References**	1. Casarett & Doul's TOXICOLOGY THE BASIC SCIENCE OF POISONS, Ninth Edition, Curtis D. Klaassen, McGraw-Hill Education (2019) 2. Lu's Basic Toxicology: Fundamentals, Target Organs, and Risk Assessment, Seventh Edition, Byung-Mu Lee, Sam Kacew, Hyung Sik Kim, Taylor & Francis Group (2018). **3.** The Toxicologist's Pocket Handbook, Third Edition, Michael J. Derelanko, Taylor & Francis Group (2018).
	Electronic Sources (Links must be added)	https://www.ekb.eg/ https://www.annualreviews.org/journal/pharmtox www.Pubmed.Com and www.sciencedirect.com
	Learning Platforms (Links must be added) **Electronic platform of Faculty of Pharmacy- Zagaig University for students**	**https://shorturl.at/sar8D**
	Other (to be mentioned)	-
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	Computer, board
	Supplies	Chemicals and Glassware
	Electronic Programs	1. Microsoft office 2. Microsoft teams
	Skill Labs/ Simulators	-
	Virtual Labs	-
	Other (to be mentioned)	-

Name and Signature
Course Coordinator

Name and Signature
Head of Department

Prof. Dr. Islam Ahmed

COURSE SPECIFICATIONS

Biotechnology & Molecular biology

Fourth year – semester 8
2025-2026

Course Specification

(2025-2026)

1. Basic Information

Course Title (according to the bylaw)	**Biotechnology and Molecular Biology**			
Course Code (according to the bylaw)	PM 805			
Department/s participating in delivery of the course	**Microbiology and Immunology**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	2 hrs/week	1 hr/week	-	3 hrs/week
Course Type	Faculty Requirements			
Academic level at which the course is taught	level 4 / Semester 8			
Academic Program	Bachelor of Pharmacy-Pharm D			
Faculty/Institute	Faculty of pharmacy			
University/Academy	Zagazig university			
Name of Course Coordinator	Prof. Dr. Fathy ElSayed Serry			
Course Specification Approval Date	18/8/2025			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council			

2. Course Overview (Brief summary of scientific content)

On completion of the course, the students will be able to identify the basic principles of microbial biotechnology and fermentation and their applications. They will understand gene cloning and recombinant DNA technology techniques and their applications. They can use biotechnology for production of essential bioproducts such as vitamins, antibiotics and vaccines. In addition, they will understand the applications of molecular techniques for production of recombinant-DNA products and nucleic acid based therapies and other major biotechnological 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**
1.1.1	Demonstrate understanding of knowledge of pharmaceutical, biomedical, social, behavioral, administrative, and clinical sciences.	**1.C1.2.1**	Identify the basic principles of microbial biotechnology and fermentation
1.1.2	Utilize the proper pharmaceutical and medical terms, abbreviations and symbols in pharmacy practice.	**1.C1.8.1**	Use the proper terms of biotechnology and molecular biology
2.3.1	Handle, identify, and dispose biotechnology-based and radio-labeled products, and other materials used in pharmaceutical field.	**2.C3.1.1**	Handle basic laboratory equipment, chemicals and biohazards effectively and safely.

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**
4.3.1	Perform self-assessment to enhance professional and personal competencies.	**4.C3.1.1**	Exhibit the capacity for critical self-reflection on professional practice and skills to address learning and development requirements.

4. Teaching and Learning Methods

1. Lectures
2. Practical sessions
3. Self- Learning (Activity)*

* The activity consists of individual written reports submitted by students, which are then discussed during the practical sessions and evaluated.

5. 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	➢ **Lecture:** Introduction to Microbial biotechnology and fermentation.	**2**	**2**	-	-	-
	➢ **Practical session:** Fermentation media.	**2**	-	**1**	-	-
2	➢ **Lecture:** - Fermentation system - Upstream and downstream processing	**2**	**2**	-	-	-
	➢ **Practical session:** Industrial fermentation and production of citric acid.	**2**	-	**1**	-	-
3	➢ **Lecture:** Production of primary metabolites ➔ alcohol, organic acids, amino acids and polysaccharides.	**2**	**2**	-	-	-

	➢ **Practical session:** Production of penicillin by fermentation.	**2**	**-**	**1**	**-**	**-**
4	➢ **Lecture:** -Production of secondary metabolites ➔ antibiotics, vitamins, insecticides -Production of microbial enzymes. ➢ **Formative assessment (quiz 1)**	**2**	**2**	**-**	**-**	**-**
	➢ **Practical session** Production of vitamin B12 by fermentation	**2**	**-**	**1**	**-**	**-**
5	➢ **Lecture** -Biotransformation. -Production of microbial biomass. -Production of immunological products and their quality control. -Production of bacterial and viral vaccines.	**2**	**2**	**-**	**-**	**-**
	➢ **Practical session** DNA extraction	**2**	**-**	**1**	**-**	**-**
6	➢ **Lecture** Production of Monoclonal antibodies, their types and applications	**2**	**2**	**-**	**-**	**-**
	➢ **Practical session** Electrophoresis ➔ agarose gel electrophoresis, polyacrylamide-Gel electrophoresis	**2**	**-**	**1**	**-**	**-**
7	➢ **Lecture:** Steps of Gene cloning & recombinant DNA (rDNA)	**2**	**2**	**-**	**-**	**-**
	➢ **Practical session:** Polymerase chain reaction	**2**	**-**	**1**	**-**	**-**
8	**Periodical Exam**					
9	➢ **Lecture:** **Molecular biology techniques** ▪ PCR ▪ DNA Microarray ▪ DNA sequencing	**2**	**2**	**-**	**-**	**-**
	➢ **Practical session:** Gene cloning	**2**	**-**	**1**	**-**	**-**

10	➢ **Lecture:** Types of expression vectors and Expression systems. ➢ **Formative assessment (quiz 2)**	**2**	**2**	**-**	**-**	**-**
	➢ **Practical session:** Orientation on Activity	**2**	**-**	**1**	**-***	**-**
11	➢ **Lecture:** ▪ Applications of rDNA in pharmaceutical & medical fields ▪ Applications rDNA technology in other Fields ➔ e.g. Microbial insecticides and biocontrol	**2**	**2**	**-**	**-**	**-**
	➢ **Practical revision and open discussion.**	**2**	**-**	**1**	**-**	**-**
12	➢ **Lecture:** ▪ Gene Therapy ▪ Nucleic acid-based therapy	**2**	**2**	**-**	**-**	**-**
	➢ **Practical exam**	**2**	**-**	**1**	**-**	**-**
13	➢ **Lecture:** ▪ Stem cells and regenerative medicine. ➢ **Formative assessment (quiz 3)**	**2**	**2**	**-**	**-**	**-**
	➢ **Practical session:** Discussion and Assessment of activity	**2**	**-**	**1**	**-***	**-**
14	**Lecture** General discussion and revision	**2**	**2**	**-**	**-**	**-**
	➢ **Practical session:** Discussion and Assessment of activity	**2**	**-**	**1**	**-***	**-**
15	**Final written exam**					

* Within biotechnology and molecular biology course, week 10 is dedicated to outlining the self-learning activity guidelines and assessment rubric. In week 13 and 14, students present their reports on assigned topics, followed by discussions with supervisors to evaluate acquired skills, findings, and conclusions. The activity is assessed using clear and consistent evaluation criteria.

6-Methods of students' assessment

No.	Assessment Methods	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Exam 1written (**Mid-term Exam**)	Week 7	10	10%
2	Exam 2 ..... (Semester work)	-	-	-
3	Final Written Exam	Week 15	50	50%
4	Final **Practical**/Clinical/… Exam	Weeks ١2	25	25%
5	Final Oral Exam	Week 15	10	10%
6	Project (**Self-learning Activity**)	Weeks 10,13,14	5	5%
7	Assignment (**Formative assessment**)	Weeks 4,10,13	-	-
8	Other (Mention)	-	-	-

7-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)	• Student book of "Notes in Biotechnology and Molecular Biology" approved by Microbiology & Immunology department (2025-2026) • Practical book of Biotechnology and Molecular Biology" approved by Microbiology & Immunology department (2025-2026)
	Other References	1- Benz, J. P., & Schipper, K. (Eds.). (2020). Genetics and biotechnology (Vol. 2). Springer Nature. 2- Fatima, G., Magomedova, A., & Parvez, S. (2024). Biotechnology and sustainable development. Shineeks Publishers. 3- Glick, B. R., & Patten, C. L. (2022). Molecular biotechnology: principles and applications of recombinant DNA. John Wiley & Sons. 4- Masoodi, K. Z., Lone, S. M., & Rasool, R. S. (2020). Advanced methods in molecular biology and biotechnology: a practical lab manual. Academic Press. 5- Najafpour, G. (2025). Biochemical engineering and biotechnology. Elsevier.

	Electronic Sources (Links must be added)	https://www.ekb.eg/ www.Pubmed.Com www.sciencedirect.com https://www.wiley.com/ https://www.springernature.com/gp
	Learning Platforms (Links must be added) **Electronic platform of Faculty of Pharmacy- Zagazig University for students**	**https://phstudent.eps.zu.edu.eg/Views/StudentViews/StudentLogin**
	Other (to be mentioned)	-
Supportive facilities & equipment for teaching and learning	**Devices/Instruments**	• **For lectures:** whiteboard, data show and computer. • **For Labs:** Autoclaves, Incubators, Ovens, fermenters, microscopes, refrigerators.
	Supplies	Chemicals, plates and microbiological culture media**.**
	Electronic Programs	1. Microsoft office 2. Microsoft teams
	Skill Labs/ Simulators	-
	Virtual Labs	-
	Other (to be mentioned)	**Videos**

Name and Signature
Course Coordinator
Prof. Dr. Fathy ElSayed Serry

Name and Signature
Head of Department
Ass.Prof. Dr. Momen Ezz-Elarab

COURSE SPECIFICATIONS

Hospital Pharmacy

Fourth year – semester 8
2025-2026

Course Specification

(2025-2026)

1. Basic Information

Course Title (according to the bylaw)	**Hospital pharmacy**			
Course Code (according to the bylaw)	**PP 802**			
Department/s participating in delivery of the course	**Pharmacy Practice** **Pharmaceutics**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	1 hr/week	**1hr/week**	**-**	**2 hrs/week**
Course Type	**Faculty requirements**			
Academic level at which the course is taught	**4**			
Academic Program	**Bachelor of Pharmacy (Pharm D)**			
Faculty/Institute	**Pharmacy**			
University/Academy	**Zagazig**			
Name of Course Coordinator	**Shereen sabry**			
Course Specification Approval Date	25/8/2025			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	**Council of Quality Assurance unit**			

2. Course Overview (Brief summary of scientific content)

On completion of the course, the student will be able to describe organization and structure of a hospital pharmacy: its facilities and services in inpatient and outpatient pharmacies, medication record, rational drug use, hospital formulary, pharmacy and therapeutic committee, IV admixtures and incompatibilities, parenteral nutrition, handling of narcotics, vaccines, biotechnology products, cytotoxics and radiopharmaceuticals, as well as patient safety and risk management.

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**
1.1.1	Demonstrate understanding of knowledge of pharmaceutical, biomedical, social, behavioral, administrative, and clinical sciences.	1.C1.7.1	Describe the structure and functions of hospital pharmacy services, including the pharmacist's roles, hospital formulary, Hospital drug distribution systems, and rational drug use.
		1.C1.7.2	Explain good dispensing practices for general and special categories of medicines, including narcotics, vaccines, cytotoxic agents, radiopharmaceuticals, and biotechnology products.
		1.C1.7.3	Identify common drug-related problems and describe appropriate management strategies, including performing pharmaceutical calculations for intravenous admixture preparation.
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.C1.1.1	Experience different duties of hospital pharmacist including prescription interpretation, drug preparation in IV unit and drug-drug interaction identification
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.C3.1.1	Dispense different medicines according to safety guidelines.
4.1.1	Demonstrate responsibility for team performance and peer evaluation of other team members, and express time management skills.	4.C1.3.1	Manage time as evidenced by the ability to plan and implement an efficient mode of working.
4.2.1	Demonstrate effective communication skills verbally, nonverbally, and in writing with professional health care team, patients, and communities.	4.C2.1.1	Communicate effectively both in oral and written manners

4. Teaching and Learning Methods

1. Lectures (data show, board)
2. Practical sessions
3. Case study (practical)
4. Problem solving (practical)
5. Blended learning
6. Electronic-based learning (Drugs.com and Medscape; applications for checking drug-drug interactions) (activity)

5. 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	Lecture -Orientation to hospital pharmacy and - -Introduction to Hospital pharmacy	1	1	-	-	-
	Practical Introduction	1	-	1	-	-
2	Lecture - Hospital formulary IV admixture	1	1	-	-	-
	Practical Translating Medication Orders	1	-	1	-	-
3	Lecture TPN	1	1	-	-	-
	Practical Translating Medication Orders	1	-	1	-	-
4	Lecture Renal dialysis fluids Formative assessment	1	1	-	-	-
	Practical Extemporaneous compounding	1	-	1	-	-
5	Lecture - Hospital drug distribution systems	1	1	-	-	-
	Practical Extemporaneous compounding	1	-	1	-	-
6	Lecture Dispensing Process	1	1	-	-	-
	Practical -Dry powders for reconstitution - Illustration of required activity (solving cases/presentation)	1	-	1	-	-
7	Lecture Dispensing biotechnology products	1	1	-	-	-
	Practical Parenteral admixtures	1	-	1	-	-

8	Periodical exam					
9	Lecture Dispensing of vaccines Dispensing of cytotoxins	1	1	-	-	-
	Practical Practical Preparation to practice	1	-	1	-	-
10	Lecture Dispensing of radiopharmaceuticals Medical gases	1	1	-	-	--
	Practical Drug Interactions Checker (internet search & report writing)	1	-	1	-	-
11	Lecture Medication errors	1	1	-	-	-
	Practical Medication errors (Case study)	1	-	1	-	-
12	Lecture Medication errors (Cont.) Formative assessment	1	1	-	-	-
	Practical Practical exam	1	-	1	-	-
13	Lecture Medication purchasing	1	1	-	-	-
	Practical Open discussion on the activity	1	-	1	-	-
14	Lecture Open discussion	1	1	-	-	-
	Practical Open discussion on the activity	1	-	1	-	-
15	Final written exam					

6. Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Exam 1written (periodical)	Week 8	10	10%
2	Exam 2 ..... (Semester work)	-	-	-
3	Final Written Exam	Week 15	50	50%
4	Final Practical/Clinical/… Exam	Week12	25	25%
5	Final Oral Exam	Week 15	10	10%
6	Self-learning activity	Week 6, 13, 14	5	5%
7	Assignment (formative assessment)	Week4,12	-	-
8	Other (Mention)	-	-	-

*** The methods mentioned are examples, the organization may add and/or delete**

7. 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)	**Student book of Hospital pharmacy and clinical pharmacy -1 approved by pharmacy practice department (2025-2026)** -١
	Other References	- Mark G. Brunton, Hospital Pharmacy Practice for Technician, Jones & Bartlett Learning, USA, 2015. - Jackson M, Lowey A. Handbook of extemporaneous preparation. A guide to pharmaceutical compounding. Published by Pharmaceutical Press, 2010. - Brown TR. Handbook of institutional pharmacy practice.4th edition, American Society of Health System Pharmacists. Bethesda, Maryland, 2006. - Peggy Piascik Peggy, PiascikVal Adams. Dispensing Biotechnology Products: Handling, Professional Education, and Product Information, 2013 - Martindale, "The extra pharmacopeia". 31st edn., by James, E.F Reynolds. And Kathleen Parfitt, Royal Pharmaceutical Society, London (2007). - Non-prescription drugs, Po Alain Li Wan, 2nd ed., Oxford Blackwell Scientific publications (1999). - Cohen MR. Medication Errors. Causes, Prevention, and Risk Management; 8.1-8.23. (2000) - Holdford DA, Brown TR. Introduction to Hospital & Health System. American Society of Health System Pharmacists. Bethesda, Maryland. - Aquilina A. The extemporaneous compounding of paediatric medicines at Mater Dei Hospital. Journal of the Malta College of Pharmacy Practice.Issue 19, 28 – 30, 2013. - Flynn E, Barker KN, Carnahan BJ. National observational study of

		prescription dispensing accuracy and safety in 50 pharmacies. J Am Pharm Assoc. 2003; 43:191–200. - Ukens C. Deadly dispensing: an exclusive survey of Rx errors by pharmacists. Drug Topics. March 13, 1997:100–11. - Strategies for Communicating Effectively with Patients, Volume 2016, Course No. 230.
	Electronic Sources (Links must be added)	http://canadianpharmacistsletter.therapeuticresearch.com/ce/ceCourse.asp... https://www.allaboutcareers.com/careers/job-profile/hospital-pharmacist https://www.slideshare.net/AbdRhmanGamilgamil/pharmacy-practice-67234967 https://www.drugs.com/drug_interactions.html www.usp.org/reporting/review/qr66.pdf https://www.slideshare.net/rameshganpisetti/14ab1t0003-handling-ofhttps://www.slideshare.net/rameshganpisetti/14ab1t0003-handling-of-radiopharmaceuticalsradiopharmaceuticals, 2018
	Learning Platforms (Links must be added)	**https://shortul.at/sar8D**
	Other (to be mentioned)	
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	Computer, board
	Supplies	Chenicals and glass ware
	Electronic Programs	1. Microsoft office 2. Microsoft teams
	Skill Labs/ Simulators	
	Virtual Labs	
	Other (to be mentioned)	

*** The list mentioned is an example, the institution may add and/or delete depending on the nature of the course**

Name and Signature **Course Coordinator** **Shereen sabry**	**Name and Signature** **Head of department** **Esraa Naguib**

COURSE SPECIFICATIONS

Pharmaceutical Technology II

Fourth year – semester 8
2025-2026

Course Specification

(2025-2026)

1. Basic Information

Course Title (according to the bylaw)	Pharmaceutical Technology II			
Course Code (according to the bylaw)	PT809			
Department/s participating in delivery of the course	Pharmaceutics department			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	1 hrs/week	1 hr/week	-	2 hrs/week
Course Type	Faculty Requirements			
Academic level at which the course is taught	Level 4- semester 8			
Academic Program	Bachelor of Pharmacy (Pharm D)			
Faculty/Institute	Faculty of pharmacy			
University/Academy	Zagazig university			
Name of Course Coordinator	Shereen Sabry			
Course Specification Approval Date	18/8/2025			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council			

2. Course Overview (Brief summary of scientific content)

The course provides students with an introduction to different pharmaceutical technology operations. It deals with the principles of various unit operations such as emulsification and mixing. The course will also cover the preformulation studies needed for development of pharmaceutical dosage forms and packaging of different pharmaceuticals

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**
1-1-1	Integrate knowledge from basic and applied pharmaceutical and clinical sciences to standardize materials, formulate and manufacture products, and deliver population and patient-centered care.	1.C1.2.1	Outline the principles and mechanisms of different pharmaceutical processes including: packaging, emulsification, mixing of solids, semisolids and liquids.
		1.C1.16.1	Identify different emerging techniques for preformulation studies, emulsification and packaging.
2-2-2	Standardize pharmaceutical materials, formulate and manufacture pharmaceutical products, and participate in systems for dispensing, storage, and distribution of medicines.	2.C2.2.1	Apply proper methodologies to select the suitable packaging materials and quality control test for them
		2.C2.4.1	Illustrate the structure of different equipment used in different unit operations such as emulsification and mixing with complete description of the principles and techniques.
		2.C2.5.1	Select the appropriate methods for synthesis and analysis of different pharmaceuticals (emulsification, packaging 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**
			preformulation)
4-4-1	Express leadership, time management, critical thinking, problem solving, independent and team working, creativity and entrepreneurial skills.	**4.C1.1.1**	Recognize the value of working in a team.
4-4-2	Effectively communicate verbally, non-verbally and in writing with individuals and communities.	**4.C2.2.1**	Demonstrate good information technology skills as well as presentation skills.

4. Teaching and Learning Methods

1- Lecture (data show, board)
2. Practical sessions
3. Problem solving (practical)
4. Self-learning (activity)

5. 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	Lecture Packaging (Definition, Selection criteria for packaging materials, Characteristics of packaging materials, Barrier properties of packaging material, Uses)	1	1	-	-	-
	Practical Packaging materials	1	1	-	-	-
2	Lecture Packaging (Classes of packaging materials and Types of packaging materials)	1	1	-	-	-
	Practical Packaging materials	1	1	-	-	-
3	Lecture Packaging (Rubbers, Plastics and Fibrous materials)	1	1	-	-	-
	Practical Packaging materials	1	1	-	-	-
4	Lecture Packaging (Films, foils, laminates (foil blister, alu alu foil, blister pack, thermoforming, cold forming, strip packing) Closures (objectives, materials) • Formative assessment	1	1	-	-	-
	Practical Quality control of packaging materials	1	1	-	-	-

5	Lecture Packaging (Quality control test for glasses)	**1**	**1**	-	-	-
	Practical Apparatus used in emulsification	**1**	**1**	-	-	-
6	Lecture Packaging: Quality control for (plastic container, metal container, strip and blister and cartoons)	**1**	**1**	-	-	-
	Practical Apparatus used in emulsification	**1**	**1**	-	-	-
7	Lecture Packaging • Quality control test for closures	**1**	**1**	-	-	-
	Practical Apparatus used in emulsification	**1**	**1**	-	-	-
8	**Periodical exam**					
9	Lecture Emulsification (Definition, Types of emulsion, Pharmaceutical applications of emulsion, Equipment used in emulsification) ✓ Homogenizers (Definition)	**1**	**1**	-	-	-
	Practical	**1**	**1**	-	-	-

	Apparatus used in emulsification+ **Activity**					
10	Lecture Emulsification ✓ Ultrasonifiers (Definition, types) ✓ Mechanical stirrers ✓ Colloid mills (principle)	**1**	**1**	-	-	-
	Practical Apparatus used in emulsification+ **Activity**	**1**	**1**	-	-	-
11	Lecture Preformulation • Definition • Preformulation studies	**1**	**1**	-	-	-
	Practical Apparatus used in emulsification+ **Activity**	**1**	**1**	-	-	-
12	Lecture Preformulation II: Bulk characterization: • Crystallinity &polymorphism • Hygroscopicity • Fine parcticle characterization **(**Coulter counter, BET) • Density (Bulk density, Tapped density, True density) • Powder flow properties (Carr`s compressibility index, Hausner ratio, B-	**1**	**1**	-	-	-

	Angle of repose) • Formative assessment					
	Practical Problems on preformulation studies	**1**	**1**	-	-	-
13	Lecture Preformulation III: Solubility studies: • Dissolution (Definition, Intrinsic dissolution rate, Noyes–Whitney equation, Sink condition)	**1**	**1**	**Practical exam**		
14	Lecture Preformulation IV: Stability analysis					
15	**Final written exam**					

6-Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Exam 1written (periodical)	Week 8	10	10 %
2	Exam 2 ..... (Semester work)	-	-	-
3	Final Written Exam	Week١٥	50	50 %
4	Final Practical/Clinical/… Exam	Week 13	25	25 %
5	Final Oral Exam	Week 15	10	10 %
6	Self-learning activity	Week 11	5	5 %
7	Assignment (formative exam)	Week 4, 12	-	-
8	Other (Mention)	-	-	-

*** The methods mentioned are examples, the organization may add and/or delete**

7-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)	Student book of pharmaceutical technolog-2 approved by Pharmaceutics Department (2022/2023).
	Other References	i- Bentley's text book of Pharmaceutics by Rawlins, E. A., 8th ed (1984). ii- Ansels Pharmaceutical Dosage forms and drug delivery systems 8/ed, Allen , L .V (2005). iii. fundamentals of packaging technology, 4 th edition, Walter Soroka, CPP, 2009 iv. packaging technology, fundamentals, materials and processes, edited by Anne Emblem and Henry Emblem, 2012 v- Pharmaceutics: The Science of Dosage Form Design by Aulton M.E., (1993). vi- The theory and Practice of Industrial Pharmacy by Leon Lachman, Lieberman, H.A., Kanig, J. L., and Febiger, Philidelphia, USA (1976). vii- Good manufacturing practice for pharmaceuticals, Nally, Joseph.D, Informa Healthcare, (2007).
	Electronic Sources (Links must be added)	www.Pubmed.com www.Sciencedirect.com **www.ekb.eg**

	Learning Platforms (Links must be added)	**https://shorturl.at/sar8D**
	Other (to be mentioned)	
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	**For lectures : Black (white) boards, computer data show, air conditioned classroom.** **For labs: Black (white) boards, data show**
	Supplies	
	Electronic Programs	**1. Microsoft office** **2. Microsoft teams**
	Skill Labs/ Simulators	
	Virtual Labs	
	Other (to be mentioned)	

*** The list mentioned is an example, the institution may add and/or delete depending on the nature of the course**

Name and Signature **Course Coordinator** **Shereen sabry**	**Name and Signature** **Head of department** **Shereen sabry**