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

Pharm-D program
Course Specification
2025/2026
Third Level
Second Semester

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Course Specification

2025

Basic Information

Course Title (according to the bylaw)	**Parasitology and virology**			
Course Code (according to the bylaw)	**PM 604**			
Department/s participating in delivery of the course	**Microbiology and immunology department**			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	2	**1**	**----**	**3**
Course Type	Compulsory			
Academic level at which the course is taught	third level,Semester 2			
Academic Program	Bachelor of Pharmacy (Pharm D program)			
Faculty	Faculty of Pharmacy			
University	Kafrelshiekh university			
Name of Course Coordinator	**Prof. Dr. Ramadan Eldomany**			
Course Specification Approval Date	9/2025			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council			

1. Course Overview (Brief summary of scientific content)

This course covers parasitic infections in humans, focusing on their biology, epidemiology, and impact. It includes medical helminthology, protozoology, and entomology, discussing morphology, life cycle, pathogenesis, diagnosis, treatment, prevention, and control. Laboratory diagnosis of parasitic infections is also addressed. The course further covers RNA and DNA viral infections, highlighting their epidemiology, clinical features, diagnosis, treatment, and prevention. It aims to provide students with essential knowledge to recognize and manage these diseases.

2. Course Learning Outcomes CLOs

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

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		**Course Learning Outcomes** Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
Domain 1 (FUNDAMENTAL KNOWLEDGE) 1-1- COMPETENCY		**Upon finishing this course, students will be able to integrate knowledge from basic parasitology and virology to understand the microbial disease in human beings.** **This competency will be developed via the following key elements:**	
1.1.1	Demonstrate understanding of knowledge of pharmaceutical, biomedical, social, behavioral, administrative, and clinical sciences.	**1.1.1**	**Discuss the impact of parasitic and viral .diseases on public health**
		1.1.2	**Recognize common parasites and viruses .affecting humans**
		1.1.3	**Describe the life cycle and pathogenesis of parasites and viruses.**
		1.1.4	**based on parasites and viruses Classify replication. and morphology**
1.1.5		**1.1.5**	**Identify relevant features of parasites and viruses linked to disease**

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**
	Retrieve information from fundamental sciences to solve therapeutic problems.	**1.1.6**	**Explain the mechanisms of infection and .host–pathogen interactions**
		1.1.7	**Apply knowledge of life cycles in of parasites and diagnosis and treatmen viruses**
		1.1.8	**Integrate fundamental science concepts to propose solutions for prevention and control of parasites and viruses**
1.1.6	Utilize scientific literature and collect and interpret information to enhance professional decisions.	**1.1.9**	**Search relevant scientific literature on .parasitic and viral diseases**
		1.1.10	**Collect epidemiological and clinical data about parasites and from reliable sources viruses**
		1.1.11	**Interpret research findings to guide for diagnosis and treatment choices parasitic and viral infections**
		1.1.12	**Apply evidence-based information to improve infection control strategies**
1.1.7	Identify and critically analyze newly emerging issues influencing pharmaceutical industry and patient health care.	**1.1.13**	**Identify newly emerging parasitic and .viral diseases affecting public health**
		1.1.14	**Analyze emerging parasitic and viral diseases impact on drug development and drug production**
		1.1.15	**Evaluate clinical challenges in diagnosis parasitic and viral forand treatment .diseases**

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**
		1.1.16	**Interpret strategies to address parasitic about emerging health threats .and viral diseases**
DOMAIN 2: PROFESSIONAL AND ETHICAL PRACTICE 2-1- COMPETENCY		**Upon finishing this course, students will be able to work collaboratively as a member of an inter-professional health care team to improve the quality of life of individuals and communities, and respect patients' rights.** **This competency will be developed via the following key elements:**	
2.1.2	Adopt ethics of health care and pharmacy profession respecting patients' rights and valuing people diversity	**2.1.1**	**Demonstrate ethics when caring for infected patients.**
		2.1.2	**Identify patients' rights and privacy.**
		2.1.3	**Recognize diversity in patients' beliefs and practices about parasitic and viral infections.**
		2.1.4	**Apply rules to give fair health care.**
2-4- COMPETENCY		**Upon finishing this course, students will be able to actively share professional decisions and proper actions to save patient's life in emergency situations and controlling severe symptoms.** **This competency will be developed via the following key elements:**	
2.4.2	Demonstrate understanding of the first aid measures needed to save patient's life.	**2.4.1**	**Identify emergency signs in parasitic and .viral infections**
		2.4.2	**Describe first aid steps for critical .parasitic and viral infection cases**

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**
2.4.4	Assess toxicity profiles of different xenobiotics and detect poisons in biological specimens.	**2.4.3**	**Assess toxicity of drugs used in treating parasitic and viral diseases.**
		2.4.4	**Analyze adverse effects related to anti-parasitic and antiviral agents.**
		2.4.5	**Evaluate the safety of therapeutic agents through parasitic and viral diseases for laboratory testing**
2-5- COMPETENCY		**Upon finishing this course, students will be able to contribute in microbiological research studies and clinical trials needed to authorize antiviral and antiparasite products.** **This competency will be developed via the following key elements:**	
2.5.2	Retrieve, interpret, and critically evaluate evidence-based information needed in pharmacy profession.	**2.5.1**	**Retrieve scientific data on parasitic and viral diseases from trusted sources.**
		2.5.2	**Interpret research findings to support parasitic anddiagnosis and treatment for .viral diseases**
		2.5.3	**Evaluate the quality of evidence for parasitic and therapeutic decisions about .viral diseases**
Domain 3: Pharmaceutical Care **3-1- Competency**		**Upon finishing this course, students will be able to apply the principles of parasitology and virology to participate in improving health care services using evidence-based data.** **This competency will be developed via the following key elements:**	
3.1.1	Apply the principles of body function and the basis of genomics in health and disease states to manage different diseases.	**3.1.1**	**Explain how parasites and viruses affect normal body functions.**
		3.1.2	**Apply genomic knowledge to understand parasitic and viralvariation.**

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	**Analyze the relationship between host genetics and parasitic and viral disease severity.**
3.1.2	Apply the principles of public health and pharmaceutical microbiology to select and assess proper methods of infection control.	**3.1.4**	**Apply public health principles to control parasitic and viral infections**
		3.1.5	**Select suitable infection control measures for different parasitic and viral pathogens.**
		3.1.6	**Assess the effectiveness of control and prevention strategies for emerging parasitic and viral diseases.**
3.1.3	Monitor and control microbial growth and carry out laboratory tests for identification of infections/diseases.	**3.1.7**	**Analyze parasitic and viral growth in laboratory settings.**
		3.1.8	**Apply control methods to limit parasite and virus spread.**
		3.1.9	**Identify parasit esand vir uses through diagnostic laboratory tests.**
		3.1.10	**Interpret laboratory data to support diagnosis for parasitic and viral diseases**
3.1.4	Relate etiology, epidemiology, pathophysiology, laboratory diagnosis, and clinical features of infections/diseases and their pharmacotherapeutic approaches.	**3.1.11**	**Relate causes and spread patterns of parasitic and viral diseases.**
		3.1.12	**Describe disease mechanisms and clinical manifestations of parasitic and viral diseases.**
		3.1.13	**Identify laboratory diagnostic methods for specific parasitic and viral infections.**
		3.1.14	**Apply otherapeutic approaches for effective treatment for parasitic and viral diseases**

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
Domain 4: Personal Practice **4-1- Competency**		**Upon finishing this course, students will be able to express leadership, time management, critical thinking, problem solving, independent and team working skills in managing parasitic and viral infections.** **This competency will be developed via the following key elements:**	
4.1.1	Demonstrate responsibility for team performance and peer evaluation of other team members, and express time management skills.	**4.1.1**	**Examine findings during parasitic and viral infection assessment**
		4.1.2	**Demonstrate parasitic and viral infection detection techniques**
4.1.2	Retrieve and critically analyze information, identify and solve problems, and work autonomously and effectively in a team.	**4.1.3**	**Retrieve relevant data on parasitic and viral diseases from scientific sources.**
		4.1.4	**Analyze information critically to understand parasitic and viral disease patterns.**
		4.1.5	**Identify problems related to diagnosis and treatment for parasitic and viral diseases.**
4.1.3	Demonstrate creativity and apply entrepreneurial skills within a simulated entrepreneurial activity.	**4.1.6**	**Design innovative approaches to parasitic and viral disease management.**
		4.1.7	**Develop strategies for healthcare entrepreneurship**
4-3- Competency		**Upon finishing this course, students will be able to express self-awareness and be a life-long learner for continuous professional improvement.** **This competency will be developed via the following key elements:**	
4.3.1		**4.3.1**	

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**
	Perform self-assessment to enhance professional and personal competencies.		**Perform regular self-assessment of knowledge and skills.**
		4.3.2	**Identify strengths and areas needing improvement.**
		4.3.3	**Develop plans to improve professional performance.**
		4.3.4	**Apply feedback to enhance personal competencies**

3. Teaching and Learning Methods

.1- Lectures (√)

2- E-learning (√)

3- Practical training/ laboratory (√)

4- Class activity (√)

5- Seminars (√)

6- Case study (√)

7- Assignment (√)

8- Virtual lab (√)

Course schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups/ .....)	Training (Practical /Clinical/ .....)	Self-learning (Tasks/ Assignments/ Projects/ ...)	Other (to be determined)
1	Introduction to parasitology	**4**	**2**	**2**		
2	Phlylum protozoa (class Rhizopoda (Entamoeba histolytica), class ciliata (Balantidium coli, sporozoa (Plasmodiae).	**4**	**2**	**2**		
3	Toxoplasma gondii, class zoomastigophora (intestinal flagellates (Giardia lamblia and Trichomonas vaginalis). Haemoflagellates (Genus Leishmania and Trypanosoma).	**4**	**2**	**2**		
4	Class trematoda: liver flukes (Faciola spp.)	**4**	**2**	**2**		
5	Schistosoma (blood fluke)	**4**	**2**	**2**		
6	Class cestoidea: Taenia spp. and Hymenolepis spp.)	**4**	**2**	**2**		
7	**Mid-term exam**					
8	Class nematoda (Trichenella spiralis and Trichurius trichura.	**4**	**2**	**2**		

9	Hook worms (Ancylostoma duodenal and Necator americanus	**4**	**2**	**2**		
10	Ascaris lumbricoides, Enterobius vermicularis and visceral larva migrans.	**4**	**2**	**2**		
11	Blood and tissue nematodes	**4**	**2**	**2**		
12	Introduction and Classification of viruses	**4**	**2**	**2**		
13	Cultivation of viruses, Clinical & laboratory diagnosis of virla infections	**4**	**2**	**2**		
14	diseases caused by DNA viruses	**4**	**2**	**Practical exam**		
15	diseases caused by RNA viruses	**4**	**2**	**Practical exam**		

4. Methods of students' assessment

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

5. Learning Resources and Supportive Facilities *

Learning resources (books, scientific references, etc.) *	**The main (essential) reference for the course** (must be written in full according to the scientific documentation method)	- Gunn, Alan, and Sarah J. Pitt. Parasitology: an integrated approach. John Wiley & Sons, 2022. - Flint, S. Jane, et al. Principles of virology, Volume 2: pathogenesis and control. John Wiley & Sons, 2020. - Parasitology Protozoology And Helminthology 13Ed (Hb 2019): (Protozoology & Helminthology - Infectious Diseases, Microbiology and Virology Paperback – 5 December 2019. - Louten, Jennifer. Essential human virology. Academic Press, 2022.
	Other References	Notes and Lab manual prepared by the department staff.
	Electronic Sources (Links must be added)	www.pubmed.com www.sciencedirect.com
	Learning Platforms (Links must be added)	**https://lms3.kfs.edu.eg/pharm/login/index.php**
	Other (to be mentioned)	www. parasitology-online.com www.cup.cam.ac.jk/journals/par. www.med.sc.edu:85/book/parasit-sta.htm.

Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	**Laboratory facilities.**
	Supplies	microscope and other lab instruments
	Electronic Programs	**----**
	Skill Labs/ Simulators	**----**
	Virtual Labs	**----**
	Other (to be mentioned)	▪ **Data show, smart board, Unit for distance learning, Computers, Internet and Library.**

Course Plan

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

Course title: parasitology and virology Course code: PM 604

Course Contents		Key elements	Teaching and Learning Methods	Student Assessment Methods
Week # 1	Introduction to parasitology	1.1.1,1.1.2,1.1.3,1.1.4,1.1.5,1.1.6	Lectures, E-learning, practical training	Written, practical and oral exams
Week # 2	Phlylum protozoa (class Rhizopoda (Entamoeba histolytica), class ciliata (Balantidium coli, sporozoa (Plasmodiae).	1.1.11, 1.1.10 ,1.1.9 ,1.1.8 ,1.1.7 ,1.1.6 /1.1.15/1.1.14/,1.1.12,1.1.13, 2.4.1/2.1.4/2.1.3/2.1.2/2.1.1/1.1.16 /2.5.3/2.5.2/2.5.1/2.4.5/2.4.4/2.4.3/2.4.2 /3.1.6/3.1.5/3.1.4/3.1.3/3.1.2/3.1.1 3.1.10/3.1.9/3.1.8/3.1.7 4.1.1 /3.1.14/3.1.13/3.1.12/3.1.11/ 4.2.7/4.2.6/4.2.5/4.2.4/4.2.3/4.1.2/ 4.3.7/4.3.6/4.3.5/4.3.4/4.3.3/4.3.2/4.3.1	Lectures, E-learning, practical training and class activity	Written, practical and oral exams
Week # 3	Toxoplasma gondii, class zoomastigophora (intestinal flagellates (Giardia lamblia and Trichomonas vaginalis). Haemoflagellates (Genus Leishmania and Trypanosoma).	1.1.10 ,1.1.9 ,1.1.8 ,1.1.7 ,1.1.6 /1.1.15/1.1.14/,1.1.12,1.1.13, 1.1.11, 2.4.1/2.1.4/2.1.3/2.1.2/2.1.1/1.1.16 3.1.1/2.5.3/2.5.2/2.5.1/2.4.5/2.4.4/2.4.3/2.4.2 /3.1.6/3.1.5/3.1.4/3.1.3/3.1.2/ /3.1.14/3.1.13/3.1.12/3.1.11/3.1.10/3.1.9/3.1.8/3.1.7 4.2.7/4.2.6/4.2.5/4.2.4/4.2.3/4.1.2/4.1.1 4.3.7/4.3.6/4.3.5/4.3.4/4.3.3/4.3.2/4.3.1	Lectures, E-learning, practical training and seminars	Written, practical and oral exams
Week # 4	Class trematoda: liver flukes (Faciola spp.)	1.1.10 ,1.1.9 ,1.1.8 ,1.1.7 ,1.1.6 /1.1.15/1.1.14/,1.1.12,1.1.13, 1.1.11, 2.4.1/2.1.4/2.1.3/2.1.2/2.1.1/1.1.16	Lectures, E-learning, practical training and class activity	Written, practical and oral exams

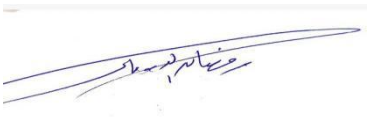
		/2.5.3/2.5.2/2.5.1/2.4.5/2.4.4/2.4.3/2.4.2 /3.1.6/3.1.5/3.1.4/3.1.3/3.1.2/3.1.1 /3.1.14/3.1.13/3.1.12/3.1.11/3.1.10/3.1.9/3.1.8/3.1.7 4.2.7/4.2.6/4.2.5/4.2.4/4.2.3/4.1.2/4.1.1 4.3.7/4.3.6/4.3.5/4.3.4/4.3.3/4.3.2/4.3.1		
Week # 5	Schistosoma (blood fluke)	1.1.10 ,1.1.9 ,1.1.8 ,1.1.7 ,1.1.6 /1.1.15/1.1.14/,1.1.12,1.1.13, 1.1.11, 2.4.1/2.1.4/2.1.3/2.1.2/2.1.1/1.1.16 2.5.3/2.5.2/2.5.1/2.4.5/2.4.4/2.4.3/2.4.2 /3.1.6/3.1.5/3.1.4/3.1.3/3.1.2/3.1.1/ /3.1.14/3.1.13/3.1.12/3.1.11/3.1.10/3.1.9/3.1.8/3.1.7 4.2.7/4.2.6/4.2.5/4.2.4/4.2.3/4.1.2/4.1.1 4.3.7/4.3.6/4.3.5/4.3.4/4.3.3/4.3.2/4.3.1	Lectures, E-learning and practical training	Written, practical and oral exams
Week # 6	Class cestoidea: Taenia spp. and Hymenolepis spp.)	1.1.10 ,1.1.9 ,1.1.8 ,1.1.7 ,1.1.6 /1.1.15/1.1.14/,1.1.12,1.1.13, 1.1.11, 2.4.1/2.1.4/2.1.3/2.1.2/2.1.1/1.1.16 2.5.3/2.5.2/2.5.1/2.4.5/2.4.4/2.4.3/2.4.2 /3.1.6/3.1.5/3.1.4/3.1.3/3.1.2/3.1.1/ /3.1.14/3.1.13/3.1.12/3.1.11/3.1.10/3.1.9/3.1.8/3.1.7 4.2.7/4.2.6/4.2.5/4.2.4/4.2.3/4.1.2/4.1.1 4.3.7/4.3.6/4.3.5/4.3.4/4.3.3/4.3.2/4.3.1	Lectures, E-learning, practical training and case study	Written, practical and oral exams
Week # 7	**Mid-term exam**			
Week # 8	Class nematoda (Trichenella spiralis and Trichurius trichura.	1.1.10 ,1.1.9 ,1.1.8 ,1.1.7 ,1.1.6 /1.1.15/1.1.14/,1.1.12,1.1.13, 1.1.11, 2.4.1/2.1.4/2.1.3/2.1.2/2.1.1/1.1.16 /2.5.3/2.5.2/2.5.1/2.4.5/2.4.4/2.4.3/2.4.2 /3.1.6/3.1.5/3.1.4/3.1.3/3.1.2/3.1.1 /3.1.14/3.1.13/3.1.12/3.1.11/3.1.10/3.1.9/3.1.8/3.1.7 4.2.7/4.2.6/4.2.5/4.2.4/4.2.3/4.1.2/4.1.1 4.3.7/4.3.6/4.3.5/4.3.4/4.3.3/4.3.2/4.3.1	Lectures, E-learning, practical training and class activity	Written, practical and oral exams

Week # 9	Hook worms (Ancylostoma duodenal and Necator americanus	1.1.10 ,1.1.9 ,1.1.8 ,1.1.7 ,1.1.6 /1.1.15/1.1.14/,1.1.12,1.1.13, 1.1.11, 2.4.1/2.1.4/2.1.3/2.1.2/2.1.1/1.1.16 3.1.1/2.5.3/2.5.2/2.5.1/2.4.5/2.4.4/2.4.3/2.4.2 /3.1.6/3.1.5/3.1.4/3.1.3/3.1.2/ /3.1.14/3.1.13/3.1.12/3.1.11/3.1.10/3.1.9/3.1.8/3.1.7 4.2.7/4.2.6/4.2.5/4.2.4/4.2.3/4.1.2/4.1.1 4.3.7/4.3.6/4.3.5/4.3.4/4.3.3/4.3.2/4.3.1	Lectures, E-learning, practical training and case study	Written, practical and oral exams
Week # 10	Ascaris lumbricoides, Enterobius vermicularis and visceral larva migrans.	1.1.11, 1.1.10 ,1.1.9 ,1.1.8 ,1.1.7 ,1.1.6 /1.1.15/1.1.14/,1.1.12,1.1.13, 2.4.1/2.1.4/2.1.3/2.1.2/2.1.1/1.1.16 3.1.1/2.5.3/2.5.2/2.5.1/2.4.5/2.4.4/2.4.3/2.4.2 /3.1.6/3.1.5/3.1.4/3.1.3/3.1.2/ /3.1.14/3.1.13/3.1.12/3.1.11/3.1.10/3.1.9/3.1.8/3.1.7 4.2.7/4.2.6/4.2.5/4.2.4/4.2.3/4.1.2/4.1.1 4.3.7/4.3.6/4.3.5/4.3.4/4.3.3/4.3.2/4.3.1	Lectures, E-learning and practical training	Written, practical and oral exams
Week # 11	Blood and tissue nematodes	1.1.10 ,1.1.9 ,1.1.8 ,1.1.7 ,1.1.6 /1.1.15/1.1.14/,1.1.12,1.1.13, 1.1.11, 2.4.1/2.1.4/2.1.3/2.1.2/2.1.1/1.1.16 2.5.3/2.5.2/2.5.1/2.4.5/2.4.4/2.4.3/2.4.2 /3.1.6/3.1.5/3.1.4/3.1.3/3.1.2/3.1.1/ /3.1.14/3.1.13/3.1.12/3.1.11/3.1.10/3.1.9/3.1.8/3.1.7 4.2.7/4.2.6/4.2.5/4.2.4/4.2.3/4.1.2/4.1.1 4.3.7/4.3.6/4.3.5/4.3.4/4.3.3/4.3.2/4.3.1	Lectures, E-learning, practical training, seminars and case study	Written, practical and oral exams
Week # 12	Introduction and Classification of viruses	1.1.1,1.1.2,1.1.3,1.1.4,1.1.5,1.1.6	Lectures, E-learning, practical training and class activity	Written, practical and oral exams
Week # 13	Cultivation of viruses, Clinical & laboratory	1.1.10 ,1.1.9 ,1.1.8 ,1.1.7 ,1.1.6 /1.1.15/1.1.14/,1.1.12,1.1.13, 1.1.11, 2.4.1/2.1.4/2.1.3/2.1.2/2.1.1/1.1.16	Lectures , E-learning, practical training ,virtual	Written, practical and oral exams

	diagnosis of virla infections	3.1.1/2.5.3/2.5.2/2.5.1/2.4.5/2.4.4/2.4.3/2.4.2 /3.1.6/3.1.5/3.1.4/3.1.3/3.1.2/ /3.1.14/3.1.13/3.1.12/3.1.11/3.1.10/3.1.9/3.1.8/3.1.7 4.2.7/4.2.6/4.2.5/4.2.4/4.2.3/4.1.2/4.1.1 4.3.7/4.3.6/4.3.5/4.3.4/4.3.3/4.3.2/4.3.1	lab and assignment	
Week # 14	diseases caused by DNA viruses	,1.1.9 ,1.1.8 ,1.1.7 ,1.1.6 /1.1.15/1.1.14/,1.1.12,1.1.13, 1.1.11, 1.1.10 2.4.1/2.1.4/2.1.3/2.1.2/2.1.1/1.1.16 2.5.3/2.5.2/2.5.1/2.4.5/2.4.4/2.4.3/2.4.2 /3.1.6/3.1.5/3.1.4/3.1.3/3.1.2/3.1.1/ /3.1.14/3.1.13/3.1.12/3.1.11/3.1.10/3.1.9/3.1.8/3.1.7 4.2.7/4.2.6/4.2.5/4.2.4/4.2.3/4.1.2/4.1.1 4.3.7/4.3.6/4.3.5/4.3.4/4.3.3/4.3.2/4.3.1	Lectures , E-learning, virtual lab and assignment	Written and oral exams
Week # 15	diseases caused by RNA viruses	,1.1.9 ,1.1.8 ,1.1.7 ,1.1.6 /1.1.15/1.1.14/,1.1.12,1.1.13, 1.1.11, 1.1.10 2.4.1/2.1.4/2.1.3/2.1.2/2.1.1/1.1.16 /2.5.3/2.5.2/2.5.1/2.4.5/2.4.4/2.4.3/2.4.2 /3.1.6/3.1.5/3.1.4/3.1.3/3.1.2/3.1.1 /3.1.14/3.1.13/3.1.12/3.1.11/3.1.10/3.1.9/3.1.8/3.1.7 4.2.7/4.2.6/4.2.5/4.2.4/4.2.3/4.1.2/4.1.1 4.3.7/4.3.6/4.3.5/4.3.4/4.3.3/4.3.2/4.3.1	Lectures , E-learning and seminars	Written and oral exams

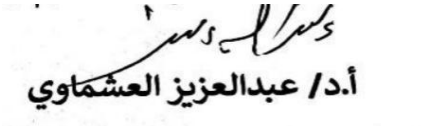
Name and Signature
Course Coordinator

Prof Dr. Ramadan Eldomany



Name and Signature
Program Coordinator

Prof Dr. Abdelaziz Elashmawy



Course Specification
(2025)

1. Basic Information

Course Title (according to the bylaw)	Biopharmaceutics and Pharmacokinetics			
Course Code (according to the bylaw)	PT 606			
Department/s participating in delivery of the course	Pharmaceutics and Pharmaceutical Technology			
Number of credit hours/points of the course (according to the bylaw)	**Theoretical**	**Practical**	**Other (specify)**	**Total**
	2	1	----	3
Course Type	Compulsory			
Academic level at which the course is taught	Third Level, Semester (2)			
Academic Program	Bachelor of Pharmacy (PharmD)			
Faculty/Institute	Faculty of Pharmacy			
University/Academy	Kafrelsheikh University			
Name of Course Coordinator	Ass. Prof. Eman Mazyad Lecturer. Ahmed Adel			
Course Specification Approval Date	9/2025			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council			

2. Course Overview (Brief summary of scientific content)

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

3. Course Learning Outcomes CLOs

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

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		**Course Learning Outcomes** Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
DOMAIN 1: FUNDAMENTAL KNOWLEDGE **1-1-COMPETENCY**		**Upon finishing this course, students will be able to integrate knowledge from basic and applied pharmaceutical and clinical sciences to identify the principle of biopharmaceutics and pharmacokinetics. This competency will be developed through the following key elements:**	
1-1-1-	**Demonstrate understanding of knowledge of pharmaceutical, biomedical, social, behavioral, administrative, and clinical sciences.**	**1.1.1.**	Recognize the relationship between the physicochemical properties of the drug (active pharmaceutical ingredient) and the drug product and the biological performance of the drug.
		1.1.2.	Learn the principles of biopharmaceutics and its strategies for enhancing drug delivery and bioavailability.
		1.1.3.	Identify the Biopharmaceutical Classification System (BCS) and its importance as a regulatory tool for biowaiver and modern drug development.
1-1-6-	**Utilize scientific literature and collect and interpret**	**1.1.4.**	Understand the principles of pharmacokinetics (absorption, distribution, metabolism, and elimination).

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**
	information to enhance professional decision.	**1.1.5.**	Know the concepts of clinical trials, bioequivalence, biowaivers and in vitro-in vivo correlations (IVIVC's).
		1.1.6.	Understand the linear pharmacokinetics following IV and oral drug administration (one compartment model).
DOMAIN 2: PROFESSIONAL AND ETHICAL PRACTICE **2-2- COMPETENCY**		**Upon finishing this course, students will be able to apply biopharmaceutics and pharmacokinetic principles in pharmaceutical product development.** **This competency will be developed via the following key elements:**	
2-2-4-	**Adopt the principles of pharmaceutical calculations, biostatistical analysis, bioinformatics, pharmacokinetics, and biopharmaceutics and their applications in new drug delivery systems, dose modification, bioequivalence studies, and pharmacy practice.**	**2.2.1.**	Describe the impact of pharmacokinetics and biopharmaceutics on the design of new drug delivery systems, dose adjustment, and bioequivalence studies.
		2.2.2.	Apply pharmacokinetic models and equations to calculate important parameters for dose optimization.
		2.2.3.	Analyze case studies and experimental data to evaluate drug bioavailability and bioequivalence
Domain 4: PERSONAL PRACTICE **4-2- COMPETENCY**		**Upon finishing this course, students will be able to effectively communicate verbally, non-verbally and in writing with individuals and communities.** **This competency will be developed via the following key elements:**	

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**
4-2-2-	**Use contemporary technologies and media to demonstrate effective presentation skills.**	**4.2.1.**	Demonstrate the ability to simplify and communicate complex pharmacokinetic and biopharmaceutic concepts through engaging and well-structured presentations
		4.2.2.	Use contemporary technologies (e.g., interactive slides, multimedia, real-time feedback tools) to deliver effective presentations in biopharmaceutics and pharmacokinetics.
		4.2.3.	Work effectively both independently and within a team in solving pharmacokinetic and biopharmaceutic problems.
4-3- COMPETENCY		**Express self-awareness and be a lifelong learner for continuous professional improvement. This competency will be developed via the following key elements:**	
4-3-2	**Practice independent learning needed for continuous professional development.**	**4.3.1**	Practice independent learning strategies (e.g., literature review, online resources, scientific databases) to solve problems related to pharmacokinetics and biopharmaceutics.
		4.3.2	Apply self-directed learning in analyzing new trends in drug delivery, dose modification, and bioequivalence studies.

4. Teaching and Learning Methods

1. Lectures (√)
2. Practical training (√)
3. Seminar / Workshop (√)
4. E-learning (√)
5. Brainstorming (√)
6. Case Study (√)
7. Presentation (√)
8. Discussion, Assignment (√)

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

5. Methods of students' assessment

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

6. Learning Resources and Supportive Facilities

Learning resources (books, scientific references, etc.)	**The main (essential) reference for the course**	Rakesh Kumar Tekade, Biopharmaceutics and Pharmacokinetics Considerations, Volume 1, 2021.
	Other References	Notes on Biopharmaceutics & Pharmacokinetics prepared by the department staff.
	Electronic Sources (Links must be added)	http://www.FDA.gov https://www.ich.org
	Learning Platforms (Links must be added)	https://lms3.kfs.edu.eg/pharm/login/index.php
	Other (to be mentioned)	----------
Supportive facilities & equipment for teaching and learning	**Devices/Instruments**	- Data show - Computers - Library - Internet - Distant learning unit - Smart board
	Supplies	Classrooms
	Electronic Programs	----------
	Skill Labs/ Simulators	----------
	Virtual Labs	----------
	Other (to be mentioned)	----------

Course Plan

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

Course title: Biopharmaceutics & Pharmacokinetics **Course code:** PT 606

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

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

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

Name and Signature
Program Coordinator

Prof. Abdelaziz Elsayed

Course Specification

(2025)

1. Basic Information

Course Title (according to the bylaw)	Phytochemistry -II			
Course Code (according to the bylaw)	PG 605			
Department/s participating in delivery of the course	Pharmacognosy			
Number of credit hours/points of the course (according to the bylaw)	Theoretical	Practical	Other (specify)	Total
	2	1		3
Course Type	compulsory			
Prerequisite	Phytochemistry -1			
Academic level at which the course is taught	Third level, semester 2			
Academic Program	Bachelor of Pharmacy (Pharm D.)			
Faculty/Institute	Faculty of Pharmacy			
University/Academy	Kafrelsheikh University			
Name of Course Coordinator	Assistant. Prof. Dr Mai El Naggar			
Course Specification Approval Date	9/2025			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department Council			

2. Course Overview (Brief summary of scientific content)

The Phytochemistry–II course aims to equip students with the knowledge and skills necessary to understand, describe, and apply the chemistry of alkaloids, tannins, and antioxidants of plant, fungal, or animal origin. The course covers techniques for the isolation, identification, and quantification of these compounds from their natural sources. Additionally, it emphasizes the study of structure–activity relationships (SAR) and pharmacophoric features of natural product–derived compounds.

3. Course Learning Outcomes CLOs

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

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		**Course Learning Outcomes** Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
DOMAIN 1. FUNDAMENTAL KNOWLEDGE: 1.1 competency		**Upon finishing this course, students will be able to build a strong scientific foundation in phytochemistry and integrate the acquired knowledge to identify, validate and authenticate natural products.**	
1.1.1	Demonstrate understanding of knowledge of pharmaceutical, biomedical, social, behavioral, administrative, and clinical sciences.	1.1.1	Identify the main classes of medicinal plants containing alkaloids, tannins, antioxidants, and other bioactive compounds.
		1.1.2	Describe the structural, chemical, and biosynthetic features of key phytochemicals.
		1.1.3	Explain the pharmacological roles of plant-derived compounds in health and disease contexts.
1.1.3	Integrate knowledge from fundamental sciences to handle, identify, extract, design, prepare, analyze, and assure quality of	1.1.4	Adress appropriate extraction and purification techniques for plant-derived active compounds.

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
	synthetic/natural pharmaceutical materials/products.	1.1.5	Identify chromatographic and spectroscopic tools to characterize and quantify phytochemicals under study.
		1.1.6	Evaluate the quality and purity of natural pharmaceutical materials under study according to pharmacopeial standards.
1.1.4	Articulate knowledge from fundamental sciences to explain drugs' actions and evaluate their appropriateness, effectiveness, and safety in individuals and populations.	1.1.7	Explain the mechanisms of action of alkaloids, tannins, antioxidants, and other natural products.
		1.1.8	Assess the safety and therapeutic efficacy of phytochemicals under study in various clinical scenarios
		1.1.9	Compare the pharmacological profiles of plant-derived agents under study to determine their suitability for specific patient groups.
1.1.5	Retrieve information from fundamental sciences to solve therapeutic problems.	1.1.10	Search and select credible scientific sources to address clinical or pharmaceutical challenges involving natural products.
		1.1.11	Analyze phytochemical data to propose evidence-based therapeutic solutions.
		1.1.12	Recommend plant-based interventions for selected health conditions based on validated research.
1.1.6	Utilize scientific literature and collect and interpret information to enhance professional decision.	1.1.13	Retrieve and summarize research findings related to medicinal plants and natural products.
		1.1.14	Interpret laboratory results to guide selection and formulation of herbal medicines.

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**
		1.1.15	Integrate literature evidence into decision-making for pharmaceutical development and patient care.
1.1.7	Identify and critically analyze newly emerging issues influencing pharmaceutical industry and patient health care	1.1.16	Identify recent advances and challenges in the use of natural products under study in pharmaceutical industries.
		1.1.17	Critically evaluate safety alerts, regulatory changes, and new scientific discoveries affecting natural product under study.
		1.1.18	Discuss the impact of emerging trends related to phytochemicals under study on both public health and pharmaceutical practice.
DOMAIN 2. PROFESSIONAL AND ETHICAL PRACTICE: **2.2. Competency**		**Upon finishing this course, students will be able to handle synthetic/natural pharmaceutical materials/products effectively and safely with respect to relevant laws and legislations.**	
2.2.1	Isolate, design, identify, synthesize, purify, analyze, and standardize synthetic/natural pharmaceutical materials.	2.2.1	Perform isolation, purification, and standardization procedures for plant-derived pharmaceutical under study using validated methods.
		2.2.2	Apply spectroscopic, chromatographic, and microscopic techniques to identify bioactive compounds under study.
2.2.2	Apply the basic requirements of quality management system in developing, manufacturing, analyzing, storing, and distributing pharmaceutical materials/	2.2.4	Implement good manufacturing practices (GMP) and good laboratory practices (GLP) in the preparation and storage of phytochemicals under study.

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**
	products considering various incompatibilities.	2.2.5	Document quality control results and corrective actions in accordance with national and international regulations related to phytochemical under study.
2.2.3	Recognize the principles of various tools and instruments and select the proper techniques for synthesis and analysis of different materials and production of pharmaceuticals.	2.2.7	Select appropriate analytical instruments for the identification and quantification of natural substances under study.
		2.2.8	Operate laboratory equipment safely and effectively.
		2.2.9	Interpret data obtained from instrumental analysis to ensure accuracy and reliability of results.
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.	2.2.10	Apply pharmaceutical calculations and statistical tools for quantification and bio evaluation of phytochemicals.
2.3. Competency		**Upon finishing this course, students will be able to contribute to pharmaceutical research studies needed to authorize medicinal products containing alkaloids, antioxidants and tannins.**	
2.3.1	Handle, identify, and dispose biologicals, synthetic/natural materials, biotechnology-based and radio-labeled products, and other	2.3.1	Demonstrate safe handling techniques for crude drugs, herbal extracts, and laboratory chemicals used in pharmacognosy.

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**
	materials/products used in pharmaceutical field.	2.3.2	Identify hazards and risk factors associated with biological, natural, synthetic, and biotechnology-based materials.
		2.3.3	Apply proper disposal procedures for different pharmaceutical materials in compliance with institutional and environmental regulation
2.3.2	Recognize and adopt ethical, legal, and safety guidelines for handling and disposal of biologicals, and pharmaceutical materials/products.	2.3.4	Identify the physicochemical properties and hazard categories of alkaloids and anticancer agents from plant or animal sources.
		2.3.5	Manipulate chemical, pharmaceutical, and biological materials following ethical, legal, and safety protocols.
		2.3.6	Follow approved Material Safety Data Sheet (MSDS) guidelines for handling, storage, and disposal of pharmaceutical substance
2-5- Competency		**Contribute in pharmaceutical research studies and clinical trials needed to authorize medicinal products.**	
2.5.1	Fulfill the requirements of the regulatory framework to authorize a medicinal product including quality, safety, and efficacy requirements.	2.5.1	Explain the national and international regulatory requirements for approving medicinal products, including quality, safety, and efficacy criteria.
		2.5.2	Evaluate pharmaceutical dossiers to ensure compliance with regulatory standards before market authorization.
		2.5.3	Apply quality, safety, and efficacy guidelines in the preparation of documentation for medicinal product registration from phytochemicals.

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
2.5.3	Contribute in planning and conducting research studies using appropriate methodologies.	2.5.4	Design a research study related to natural product development using valid and ethical methodologies.
		2.5.5	Implement appropriate data collection and analysis techniques to investigate research questions in phytochemistry
		2.5.6	Interpret research findings and formulate evidence-based conclusions to address identified problems or hypotheses related to phytochemicals under study.
DOMAIN 3: PHARMACEUTICAL CARE **3-2- Competency**		**Provide counseling and education services to patients and communities about safe and rational use of medicines and medical devices.**	
3.2.3	Provide evidence-based information about safe use of complementary medicine including phytotherapy, aromatherapy, and nutraceuticals	3.2.1	Retrieve and critically appraise scientific literature to support the safe use of alkaloids and natural anti-cancer agents.
		3.2.2	Explain the pharmacological basis, therapeutic benefits, and potential risks of selected alkaloids and natural anti-cancer agents.
		3.2.3	Develop patient-centered educational materials promoting the safe and effective use of alkaloids and natural anti-cancer agents.
3.2.4	Provide information about toxic profiles of drugs and other xenobiotics including sources, identification, symptoms, and management control.	3.2.4	Identify toxic agents, including plant-derived poisons and other xenobiotics, and describe their chemical and biological 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**
		3.2.5	Interpret clinical signs and symptoms of toxicity to aid in accurate diagnosis and timely intervention.
		3.2.6	Recommend evidence-based management strategies and antidotes for the treatment of poisoning caused by alkaloids and natural anti-cancer agents..
DOMAIN 4: PERSONAL PRACTICE **4.2. Competency**		**Upon finishing this course, students will be able to effectively communicate verbally, non-verbally and in writing with patient and health care team.**	
4.2.2	Use contemporary technologies and media to demonstrate effective presentation skills.	4.2.1	Design and structure professional presentations on phytochemistry topics using advanced digital tools and multimedia resources.
		4.2.2	Deliver oral and visual presentations effectively, employing recent technologies to engage the audience and convey complex information clearly.
		4.2.3	Evaluate personal presentation performance and integrate constructive feedback to improve delivery, content organization, and use of media.

4. Teaching and Learning Methods

1. Lectures
2. Practical training/ laboratory
3. Class activity
4. E-learning
5. Presentation

Course Schedule						
Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups/ .....)	Training (Practical /Clinical/ .....)	Self-learning (Tasks/ Assignments/ Projects/ ...)	Other (to be determined)
1	Introduction to alkaloid, identification, isolation & purification	**4**	2	2		
2	Atypical/non-heterocyclic alkaloids: (Capsaicin, mescaline, Ephedra, Khat, and tropolone alkaloids)	**4**	2	2		
3	Pseudoalkaloids: steroidal (solanum and veratrum alkaloids), terpenoid (paclitaxel and aconitine) and purine alkaloids	**4**	2	2		
4	Typical/heterocyclic pyridine and piperidine alkaloids (trigonelline, tobacco alkaloid, Areca, lobelia, pomegranate alkaloids, coniine and ricinine)	**4**	2	2		

5	Typical/heterocyclic Tropane alkaloids of family Solanaceae and Coca leaves, imidazole, pyrrolizidine, and quinolizidine alkaloids	**4**	2	2		
6	Typical/heterocyclic Indole and quinoline alkaloids	**4**	2	2		
7	**Mid-term exam**					
8	- Isoquinoline group and opium alkaloids - Drugs acting on the CNS and abused drugs. - Anti-Cancer drugs	**4**	2	2		
9	Revision on alkaloids	**4**	2	2		
10	Tannins (hydrolysable and condensed tannins)	**4**	2	2		
11	Chemistry of natural antioxidants	**4**	2	2		
12	Chromatographic techniques for the isolation and identification of natural products	**4**	2	2		
13	Cont. Chromatographic techniques for the isolation and identification of natural products	**4**	2	**2**		
14	Cont. Chromatographic techniques for the isolation and identification of natural products	**2**	2	Practical exam		
15	Revision	**2**	2	Practical exam		

5. Methods of students' assessment

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

4	Final Oral Exam	16, 17	10	10%
5	Assignments / Project /Portfolio/ Logbook	14, 15	10	10%

6. 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)	• Aniszewski, T. (2021). *Alkaloids: Chemistry, biology, ecology, and applications* (3rd ed.). Elsevier. • Badal McCreath, S., & Clement, Y. N. (Eds.). (2023). *Pharmacognosy: Fundamentals, applications and strategies* (2nd ed.). Academic Press. https://doi.org/10.1016/C2020-0-01935-8 • Ganora, L. (2021). *Herbal constituents: Foundations of phytochemistry* (2nd ed.). Herbalchem Press. • Rajendran, J. L., & Raman, D. (2022). *Experimental pharmacognosy-I: Pharmacognosy and phytochemistry*. Pharma Publications. • Singh, S. B., & Pelaez, F. (Eds.). (2021). *Bioactive natural products in drug discovery*. Springer. https://doi.org/10.1007/978-981-15-1394-7
	Other References	• Fattorusso, E., & Taglialatela-Scafati, O. (2008). *Modern alkaloids: Structure, isolation, synthesis, and biology*. Wiley-VCH.
	Electronic Sources (Links must be added)	www.biomedcentral.com www.medscape.com

		http://www.sciencedirect.com/ http://www.ncbi.nlm.nih.gov/ https://go.drugbank.com/
	Learning Platforms (Links must be added)	https://lms3.kfs.edu.eg/pharm/login/index.php
	Other (to be mentioned)	
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	Water baths Microscopes Uv –lamp Spectrophotometers
	Supplies	Class rooms Computers Library Internet Data show
	Electronic Programs	
	Skill Labs/ Simulators	Interactive boards and distant learning unit
	Virtual Labs	-
	Other (to be mentioned)	

Name and Signature **Course Coordinator** **Assistant. Prof. Dr. Mai El Naggar**	**Name and Signature** **Program Coordinator** **Prof. Dr. Abdelaziz El Ashmawy**

Kafrelsheikh University
Faculty of Pharmacy

جامعة كفر الشيخ
كلية الصيدلة

Course Specification
2025

1. Basic Information

Course Title (according to the bylaw)	Pharmaceutics IV			
Course Code (according to the bylaw)	PT 607			
Department/s participating in delivery of the course	Pharmaceutics & Pharmaceutical Technology			
Number of credit hours/points of the course (according to the bylaw)	Theoretical	Practical	Other (specify)	Total
	2	1	----	3
Course Type	compulsory			
Academic level at which the course is taught	Third level, Semester (2)			
Academic Program	Bachelor of pharmacy (Pharm D)			
Faculty/Institute	Faculty of Pharmacy			
University/Academy	Kafrelsheikh University			
Name of Course Coordinator	Prof. Abdelaziz Elashmawy Ass. Prof. Eman Mazyad			
Course Specification Approval Date	9/2025			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department council			

2. Course Overview (Brief summary of scientific content)

This course involves principles of formulation, development, sterilization, packaging and quality control testing of pharmaceutical sterile drug products. Principles for calculation and manipulation of parenteral, ophthalmic preparations, vaccines and blood products are emphasized. The course also covers the basic principles of formulation, sterilization, packaging and applications of radiopharmaceuticals in pharmacy and medicine. An in-depth study on formulation, manufacturing, quality control testing and applications of aerosols and other inhalation products is also accentuated.

3. Course Learning Outcomes CLOs

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

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		**Course Learning Outcomes** Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
Domain 1 (FUNDAMENTAL KNOWLEDGE) 1-1- COMPETENCY		**Upon finishing this course, students will be able to formulate and manufacture different sterile drug products and inhalation products.** **This competency will be developed via the following key elements:**	
1.1.1	Demonstrate understanding of knowledge of pharmaceutical, biomedical, social, behavioral, administrative, and clinical sciences.	**1.1.1**	Study different types of pharmaceutical sterile drug products (Parenteral, ophthalmic preparations, vaccines, and blood products)
		1.1.2	Describe different sterilization techniques applied in the manufacture of different pharmaceutical sterile drug products.
		1.1.3	Identify the applications of different radiopharmaceuticals in pharmacy and medicine.
		1.1.4	Describe different types of inhalation drug products.
		1.1.5	Discuss Packaging and sterilization techniques applied in the manufacture of Sterile drug 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**
		1.1.6	Recognize theory of vaccination and types of vaccines.
1.1.3	Integrate knowledge from fundamental sciences to handle, identify, extract, design, prepare, analyze, and assure quality of synthetic/natural pharmaceutical materials/products.	**1.1.7**	Identify the formulation development steps applied in the manufacture of pharmaceutical sterile drug products.
		1.1.8	Identify the formulation development steps applied in the manufacture of radiopharmaceuticals.
		1.1.9	Know different quality control tests applied during and after the manufacture of pharmaceutical sterile drug products.
		1.1.10	Identify the packageing process applied in the manufacture of different radiopharmaceuticals , sterile drug products and different inhalation products.
DOMAIN 2: PROFESSIONAL AND ETHICAL PRACTICE 2-2- COMPETENCY		**Upon finishing this course, students will be able to formulate and manufacture pharmaceutical products, mentioned in this course.** **This competency will be developed via the following key elements:**	
2.2.1	Isolate, design, identify, synthesize, purify, analyze, and standardize synthetic/natural pharmaceutical materials.	**2.2.1**	Apply advanced isolation and purification methodologies to obtain sterile synthetic and natural pharmaceutical materials with high safety and efficacy profiles.
		2.2.2	Design and synthesize sterile dosage forms, including parenteral, and ophthalmic preparation with optimized physicochemical and biopharmaceutical properties.
		2.2.3	Conduct comprehensive analytical testing and standardization to ensure product quality, sterility, and compliance with

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**
			international pharmacopeial requirements.
2.2.2	Apply the basic requirements of quality management system in developing, manufacturing, analyzing, storing, and distributing pharmaceutical materials/ products considering various incompatibilities.	**2.2.4**	Apply Good Manufacturing Practices (GMP) for the preparation and handling of sterile dosage forms to ensure product safety and contamination control.
		2.2.5	Apply quality assurance protocols for the production and testing of radiopharmaceuticals, considering stability and radiation safety requirements.
		2.2.6	Conduct analytical quality control to verify the purity, potency, and performance of inhalation products in compliance with pharmacopeial standards
		2.2.7	Establish proper storage and distribution procedures to maintain product integrity and prevent incompatibilities during transportation and shelf-life
2.2.3	Recognize the principles of various tools and instruments and select the proper techniques for synthesis and analysis of different materials and production of pharmaceuticals.	**2.2.8**	Apply appropriate aseptic techniques and specialized equipment for the synthesis and quality assessment of sterile dosage forms.
		2.2.9	Utilize advanced instrumentation and analytical methods in the preparation, labeling, and quality control of radiopharmaceuticals.
		2.2.10	Select suitable inhalation devices and analytical tools for the formulation, testing, and optimization of inhalation products.
2.2.4	Adopt the principles of pharmaceutical calculations, biostatistical analysis,	**2.2.11**	Recognize principles of pharmaceutical calculation for preparation of sterile dosage forms including parenteral,

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**
	bioinformatics, pharmacokinetics, and biopharmaceutics and their applications in new drug delivery systems, dose modification, bioequivalence studies, and pharmacy practice		ophthalmic preparations and inhalation products.
		2.2.12	Integrate biopharmaceutic principles to enhance the therapeutic efficacy and safety of sterile dosage forms.
2-3- COMPETENCY		**Upon finishing this course, students will be able to handle and dispose of pharmaceutical materials/products effectively and safely with respect to relevant laws and legislations.** **This competency will be developed via the following key elements:**	
2.3.1	Handle, identify, and dispose biologicals, synthetic/natural materials, biotechnology-based and radio-labeled products, and other materials/products used in pharmaceutical fields.	**2.3.1**	Safely handle different chemicals and radio-labeled products to avoid harm to the students.
2.3.2	Recognize and adopt ethical, legal, and safety guidelines for handling and disposal of biological, and pharmaceutical materials/products.	**2.3.2**	Recognize and adopt MSDS safety guidelines for safe and appropriate handling and disposal of pharmaceutical chemical materials used in sterile product preparation.
		2.3.3	Dispose radiopharmaceutical products/waste safely to avoid the environmental hazards
Domain 4: Personal Practice **4-2- Competency**		**Upon finishing this course, students will be able to Effectively communicate verbally, non-verbally and in writing with individuals and communities.** **This competency will be developed via the following key elements:**	

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**
4.2.2	Use contemporary technologies and media to demonstrate effective presentation skills.	**4.2.1**	Perform presentation on advanced topics covered in the course, particularly in the field of radiopharmaceuticals
		4.2.2	Employ interactive tools (videos, images, graphs, real-time polling/feedback) to simplify and communicate complex concepts such as sterile dosage forms, drug delivery systems, and bioequivalence studies.

4. Teaching and Learning Methods

1- Lectures (√)

2- E-learning (√)

3- Practical training/ laboratory (√)

4- Seminars (√)

5- Discussion (√)

6- Brainstorming (√)

7- Assignment (√)

8- Case study (√)

Course Schedule						
Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/ discussion groups/ .....)	**Training (Practical/ Clinical/ .....)**	**Self-learning (Tasks/ Assignments/ Projects/ ...)**	**Other (to be determined)**
1	Introduction to Parenterals	4	2	2	-------	-------
2	Introduction to Ophthalmic preparations	4	2	2	-------	-------
3	Introduction to Vaccines	4	2	2	-------	-------
4	Introduction to Blood products	4	2	2	-------	-------
5	Formulation development applied during the manufacture of sterile drug products.	4	2	2	-------	-------
6	Packaging and sterilization techniques applied in the manufacture of Sterile drug products.	4	2	2	-------	-------
7	Periodical exam					
8	Quality control testing of Sterile drug products	4	2	2	-------	-------
9	Introduction to Radiopharmaceuticals	4	2	2	-------	-------
10	Formulation development applied during the manufacture of Radiopharmaceuticals	4	2	2	-------	-------

11	Packaging and sterilization techniques applied in the manufacturing of Radiopharmaceuticals	4	2	2	-------	-------
12	Introduction to Inhalation of drug products	4	2	2	-------	-------
13	Aerosols	4	2	2	-------	-------
14	Formulation development applied during the manufacture of Inhalation drug products.	4	2	Practical exam	-------	-------
15	Packaging and sterilization techniques applied in the manufacture of Inhalation drug products.	4	2	Practical exam	-------	-------

5. Methods of students' assessment

No.	Assessment Methods	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Periodical exam	7	15	15%
2	Final Practical/Clinical/… Exam	14,15	15	15%
3	Final Written Exam	16,17	50	50%
4	Final Oral Exam	16,17	10	10%
5	Assignments / Project /Portfolio/ Logbook	12, 13	10	10%

6. Learning Resources and Supportive Facilities

Learning resources (books, scientific references, etc.)	**The main (essential) reference for the course**	- Mahato RI, Narang AS. Pharmaceutical Dosage Forms and Drug Delivery: Third Edition, Revised and Expanded. Boca Raton (FL): CRC Press; 2018. ISBN-13: 978-1482253627. -Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems. 10th ed. Baltimore (MD): Lippincott Williams & Wilkins; 2010.

	Other References	Notes and Lab manual prepared by the department staff.
	Electronic Sources (Links must be added)	www.pubmed.com www.sciencedirect.com
	Learning Platforms (Links must be added)	**https://lms3.kfs.edu.eg/pharm/login/index.php**
	Other (to be mentioned)	
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	Laboratory facilities (Equipment of factory).
	Supplies	Water bath, digital balances and other lab instruments
	Electronic Programs	----
	Skill Labs/ Simulators	----
	Virtual Labs	----
	Other (to be mentioned)	Data show, smart boards, Unit for distance learning, Computers, Internet and Library.

Course Plan

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

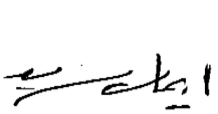
Course title: Pharmaceutics IV **Course code: PT 607**

Course Contents		Key elements	Teaching and Learning Methods	Student Assessment Methods
Week # 1	Introduction to Parenterals	1.1.1, 1.1.2 ,1.1.5 , 2.2.1, 2.2.2 .	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
Week # 2	Introduction to Ophthalmic preparations	1.1.1, 1.1.3, 2.2.1, 2.2.2 , 2.2.4 , 2.2.12.	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
Week # 3	Introduction to Vaccines	1.1.1, 1.1.2, 1.1.3, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 4.2.1.	Lectures, E-learning, practical training and presentation	Written, practical and oral exams
Week # 4	Introduction to Blood products	1.1.2, 1.1.3, 1.1.5, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 4.2.1 ,4.2.2.	Lectures, E-learning, practical training and seminar	Written, practical and oral exams
Week # 5	Formulation development applied during the manufacture of sterile drug products.	1.1.2,1.1.5,1.1.7, 2.2.1,2.2.2,2.2.3, 2.2.5, 2.2.8	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
Week # 6	Packaging and sterilization techniques applied in the manufacture of Sterile drug products.	1.1.1, 1.1.2, 1.1.3, 2.2.1, 2.2.2, 2.2.3, 2.2.4 , 4.2.1.	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
Week # 7	Periodical exam			
Week # 8	Quality control testing of Sterile drug products	1.1.1, 1.1.5, 4.2.1, 2.2.4, 2.2.5, 2.2.6, 2.2.7.	Lectures, E-learning, practical training and presentation	Written, practical and oral exams

Week # 9	Introduction to Radiopharmaceuticals	1.1.3, 1.1.6, 1.1.8, 2.2.5, 2.3.1, 2.3.3.	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
Week # 10	Formulation development applied during the manufacture of Radiopharmaceuticals.	1.1.3, 1.1.6, 1.1.8, 2.2.5, 2.3.1, 2.3.3. 4.2.1 ,4.2.2.	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
Week # 11	Packaging and sterilization techniques applied in the manufacturing of Radiopharmaceuticals	1.1.8, 2.2.3, 2.2.7, 2.2,4, 2.2.9, 2.3.1, 2.3.2, 2.3.3, 4.2.2.	Lectures, E-learning, practical training, seminars and class activities	Written, practical and oral exams
Week # 12	Introduction to Inhalation of drug products	1.1.4, 1.1.8, 2.2.3, 2.2.6, 2.2.7, 2.2.10, 4.2.1,	Lectures, E-learning, seminars and practical training	Written, practical and oral exams
Week # 13	Aerosols	1.1.4, 1.1.8, 2.2.3, 2.2.6, 2.2.7, 2.2.10, 2.2.12, 4.2.1,	Lectures and E-learning	Written, practical and oral exams
Week # 14	Formulation development applied during the manufacture of Inhalation drug products.	1.1.4, , 1.1.9, 1.1.10, 2.2.3, 2.2.6, 2.2.7, 2.2.10, 2.2.12, 4.2.1,	Lectures and E-learning practical training	Written, practical and oral exams
Week # 15	Packaging and sterilization techniques applied in the manufacture of Inhalation drug products	1.1.1, 1.1.7, 1.1.8, 1.1.10, 2.2.4, 2.2.11, 2.3.12, 4.2.1.	Lectures and E-learning practical training	Written, practical and oral exams

Name and Signature
Course Coordinator
Prof. Abdelaziz Elashmawy
Ass. Prof. Eman Mazyad

Name and Signature
Program Coordinator
Prof. Abdelaziz Elashmawy



Course Specification

(2025)

1. Basic Information

Course Title (according to the bylaw)	Pharmacology II			
Course Code (according to the bylaw)	PO 603			
Department/s participating in delivery of the course	Pharmacology & Toxicology			
Number of credit hours/points of the course (according to the bylaw)	Theoretical	Practical	Other (specify)	Total
	2	1		3
Course Type	Compulsory			
Academic level at which the course is taught	Third Level, semester 2			
Academic Program	Bachelor of Pharmacy (Pharm D)			
Faculty/Institute	Faculty of Pharmacy			
University/Academy	Kafrelsheikh University			
Name of Course Coordinator	Prof. Dr. Sherin zakaria			
Course Specification Approval Date	9/2025			
Course Specification Approval (Attach the decision/minutes of the department /committee/council ....)	Department council			

2. Course Overview (Brief summary of scientific content)

This course provides an in-depth study of the pharmacological actions of drugs acting on the central nervous system, gastrointestinal tract, respiratory system, and blood. It covers the mechanisms of action, therapeutic uses, and adverse effects of these agents. The course also addresses the pharmacology of autacoids, including their role in inflammation and allergy, as well as drugs used in the treatment of related conditions. Emphasis is placed on integrating pharmacological principles with the underlying physiology and pathophysiology of relevant disease processes.

3. Course Learning Outcomes CLOs

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

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		**Course Learning Outcomes** Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
Domain 1 (FUNDAMENTAL KNOWLEDGE) 1-1- COMPETENCY		**Upon successful completion of this course, students will be able to explain the pharmacological effects, mechanisms of action, side effects, and contraindications of drugs acting on the central nervous system (CNS), gastrointestinal tract (GIT), respiratory system, blood, and autacoids. They will demonstrate the ability to evaluate drug use, recognize and interpret adverse effects, and conduct practical screening of CNS drugs in laboratory animals. This competency will be developed via the following key elements:**	
1.1.1	Demonstrate understanding of knowledge of pharmaceutical, biomedical, social, behavioral, administrative, and clinical sciences.	1.1.1	Demonstrate the different categories of central nervous system drugs
		1.1.2	Demonstrate understanding of the pharmacology of autacoids and narcotic analgesics drugs
1.1.4	Articulate knowledge from fundamental sciences to explain drugs' actions and evaluate	1.1.3	Demonstrate understanding of the pharmacological intervention in peptic ulcer, GERD, vomiting, IBS, IBD, managing depression, anxiety, parkinsonism, schizophrenia, and Alzheimer's disease.

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**
	their appropriateness, effectiveness, and safety in individuals and .populations		
1.1.5	Retrieve information from fundamental sciences to solve therapeutic problems.	1.1.4	Retrieve information about managing depression, anxiety, parkinsonism, schizophrenia, and Alzheimer's disease
		1.1.5	Identify mechanism of action of drugs affecting blood and respiratory system
DOMAIN 2: PROFESSIONAL AND ETHICAL PRACTICE **2-1- COMPETENCY**		**Upon completion of the course, the student will be able to apply pharmacological principles to design appropriate therapeutic plans for diverse patient cases, and demonstrate safe practices in handling synthetic substances and laboratory animals to ensure individual and environmental safety.** **This competency will be developed via the following key elements:**	
2.1.2	Adopt ethics of health care and pharmacy profession respecting patients' rights and valuing people diversity.	2.1.1	Apply pharmacological knowledge to set the therapeutic intervention in different patients.
2-2- COMPETENCY		**Upon completion of the course, the student will be able to distinguish between central nervous system stimulants and depressants by analyzing their characteristics, metabolic pathways, therapeutic actions, and potential toxicities.** **This competency will be developed via the following key elements:**	
2.2.4	Adopt the principles of pharmaceutical calculations, biostatistical analysis, bioinformatics, pharmacokinetics, and bio-pharmaceutics and their applications in new	2.2.1	Demonstrate practical skills in screening drugs affecting the central nervous system using laboratory animal experiments, and use scientific data to support safe and effective pharmacy practice.

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**
	drug delivery systems, dose modification, bioequivalence studies, and pharmacy practice .		
2-3- COMPETENCY		**Upon completion of the course, the student will be able to demonstrate safe and responsible use of laboratory reagents, handle synthetic materials and experimental animals with care, and adhere to established safety protocols for the ethical handling and disposal of laboratory animals and pharmaceutical substances** **This competency will be developed via the following key elements:**	
2.3.1	Handle, identify, and dispose biologicals, synthetic/natural materials, biotechnology-based and radio-labeled products, and other materials/products Used in pharmaceutical fields.	**2.3.1**	Use effectively laboratory reagents appropriately and safely.
		2.3.2	Handle safely synthetic materials and experimental animals
2.3.2	Recognize and adopt ethical, legal, and safety guidelines for handling and Disposal of biologicals, and pharmaceutical materials/products.	**2.3.3**	Recognize and adopt safety guidelines for safe and appropriate handling of animals, their disposal and disposal of the used drugs.
2-4- Competency		**Upon completion of the course, the student will be able to identify pathological conditions affecting the central nervous system, gastrointestinal tract, respiratory system, blood, and autacoids, and apply appropriate pharmacological strategies to manage the related disorders.** **This competency will be developed via the following key elements:**	

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
2.4.3	Take actions to solve any identified medicine-related and pharmaceutical care problems.	**2.4.1**	Utilize the different pharmacologic interventions used to manage peptic ulcer, GERD, vomiting, irritable bowel syndrome and inflammatory bowel diseases.
		2.4.2	Apply their knowledge to detect different pathological conditions related to CNS, GIT, respiratory system, blood, and autacoids.
Domain 3: Pharmaceutical Care **3-2- Competency**		**Upon completion of the course, the student will be able to integrate pharmacological knowledge to choose appropriate drug therapies tailored to individual patient needs, assess the effects of medications acting on the CNS, GIT, respiratory system, blood, and autacoids, and develop effective pharmaceutical care plans to ensure optimal therapeutic outcomes.** **This competency will be developed via the following key elements:**	
3.2.1	Integrate the pharmacological properties of drugs including mechanisms of action, therapeutic uses, dosage, contra-indications, adverse drug reactions and drug interactions.	**3.2.1**	Integrate knowledge to select suitable drugs according to patient's criteria.
3.2.2	Apply the principles of clinical pharmacology and pharmacovigilance for the rational use of medicines and medical devices.	**3.2.2**	Monitor the pharmacological effects of different CNS modulating drugs, GIT acting drugs, respiratory system acting drugs, blood acting drugs and drugs affecting autacoids.

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
		3.2.3	Provide suitable pharmaceutical care plan to patients based on their pharmacological knowledge.
Domain 4: Personal Practice **4-2- Competency**		**Upon finishing this course, students will be able to Effectively communicate verbally, non-verbally and in writing with individuals and communities.** **This competency will be developed via the following key elements:**	
4.2.2	Use contemporary technologies and media to demonstrate effective presentation skills.	4.2.1	Acquire effective presentation skills in the modern technology and media to create engaging and memorable experiences. This includes using interactive slides, incorporating multimedia (videos, images, audio), and employing tools for real-time feedback and collaboration. By integrating these elements, student can enhance audience engagement, clarify complex information, and leave a lasting impact.
		4.2.2	Demonstrate effective communication by verbal means and appreciate the joint effort in teamwork

4. Teaching and Learning Methods

1. Lectures
2. E-learning
3. Practical training/ laboratory
4. Case study
5. Brain storming
6. Assignment
7. Discussion
8. Seminars

Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/discussion groups/ .....)	**Training** (Practical/Clinical/ .....)	**Self-learning** (Tasks/ Assignments/ Projects/ ...)	**Other** (to be determined)
1	Pharmacological actions of drugs acting on central nervous system	4	2	2		
2	Pharmacological actions of drugs acting on central nervous system	4	2	2		
3	Pharmacological actions of drugs acting on central nervous system	4	2	2		
4	Pharmacological actions of drugs acting on central nervous system	4	2	2		
5	Pharmacological actions of drugs acting on central nervous system	4	2	2		
6	Pharmacological actions of drugs acting on central nervous system	4	2	2		
7	**Semester work**					
8	Pharmacological actions of drugs acting on GIT	**4**	**2**	**2**		
9	Pharmacological actions of drugs acting on GIT(cont.)	**4**	**2**	**2**		
10	Pharmacological actions of drugs acting on GIT(cont.)	**4**	**2**	**2**		
11	Pharmacological actions of drugs acting on GIT(cont.)	**4**	**2**	**2**		
12	Pharmacological actions of drugs acting on GIT(cont.)	**4**	**2**	**2**		
13	Pharmacological actions of drugs acting on blood and respiratory system	**4**	**2**	**Revision**		
14	Autacoids	**2**	**2**	Practical exam		
15	Revision	**2**	**2**	Practical exam		

5. Methods of students' assessment

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

6. 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)	The Pharmacological Basis of Therapeutics (2008). Goodman & Gilman's. 12 th editions. The McGraw-Hill Companies
	Other References	-Basic & Clinical Pharmacology (2021`). BG. Katzung.15 th ed. McGraw-Hill . -Pharmacology (2007). Rang H.P.& Dale M. 7th Edition. Churchill Livingston London -Lippincott Modern Pharmacology (2019). C. Champe, A. Harvey and Denise R. (illustrated pharmacology Review). South Asian Edition. Lippincott Williams & Wilkins
	Electronic Sources (Links must be added)	www.biomedcentral.com -www.Pubmed.com -www.medscape.com
	Learning Platforms (Links must be added)	**https://lms3.kfs.edu.eg/pharm/login/index.php**
	Other (to be mentioned)	
Supportive facilities & equipment for teaching and learning *	**Devices/Instruments**	-Data show -Computers –Internet
	Supplies	Laboratory facilities: laboratory animals, chemicals, drugs, animal cages, digital balances and funnels.

		- Lab notebooks.
	Electronic Programs	----------
	Skill Labs/ Simulators	----------
	Virtual Labs	----------
	Other (to be mentioned)	-Class rooms. -Library

Course Plan

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

Course title: Pharmacology II **Course code: PO 603**

Course Contents		Key Elements	Teaching and Learning Methods	Student Assessment Methods
Week # 1	Pharmacological actions of drugs acting on central nervous system	1.1.1 , 1.1.2, 1.1.3, 1.1.4 2.1.1, 2..2.1, ,2.3.1, 2.3.2, 2.3.3, 2.4.2, 3.2.1, 3.2.2, , 3.2.3 4.2.1, 4.2.2	Lectures and practical training	Written, practical and oral exams
Week # 2	Pharmacological actions of drugs acting on central nervous system (con)	1.1.1 , 1.1.2, 1.1.3, 1.1.4 2.1.1, 2..2.1, ,2.3.1, 2.3.2, 2.3.3, 2.4.2, 3.2.1, 3.2.2, , 3.2.3 4.2.1, 4.2.2	Lectures and practical training, discussion	Written, practical and oral exams
Week # 3	Pharmacological actions of drugs acting on central nervous system (con)	1.1.1 , 1.1.2, 1.1.3, 1.1.4 2.1.1, 2..2.1, ,2.3.1, 2.3.2, 2.3.3, 2.4.2, 3.2.1, 3.2.2, , 3.2.3 4.2.1, 4.2.2	Lectures and practical training	Written, practical and oral exams
Week # 4	Pharmacological actions of drugs acting on central nervous system (con)	1.1.1 , 1.1.2, 1.1.3, 1.1.4 2.1.1, 2..2.1, ,2.3.1, 2.3.2, 2.3.3, 2.4.2, 3.2.1, 3.2.2, , 3.2.3 4.2.1, 4.2.2	Lectures and practical training, discussion	Written, practical and oral exams
Week # 5	Pharmacological actions of drugs acting on central nervous system (con)	1.1.1 , 1.1.2, 1.1.3, 1.1.4 2.1.1, 2..2.1, ,2.3.1, 2.3.2, 2.3.3, 2.4.2, 3.2.1, 3.2.2, , 3.2.3 4.2.1, 4.2.2	Lectures and practical training	Written, practical and oral exams

Week # 6	Pharmacological actions of drugs acting on central nervous system (con)	1.1.1 , 1.1.2, 1.1.3, 1.1.4 2.1.1, 2..2.1, ,2.3.1, 2.3.2, 2.3.3, 2.4.2, 3.2.1, 3.2.2, , 3.2.3 4.2.1, 4.2.2	Lectures and practical training, e-learning, discussion	Written, practical and oral exams
Week # 7	**Semester work**			
Week # 8	Pharmacological actions of drugs acting on GIT	1.1.3 2.1.1, 2.3.1, 2.3.2, ,2..4.1, 2..4.2 3.2..1, 3.2.2, 3.2.3 4.2.1, 4.2.2	Lectures and practical training, e-learning, case study	Written, practical and oral exams
Week # 9	Pharmacological actions of drugs acting on GIT(cont.)	1.1.3 2.1.1, 2.3.1, 2.3.2, ,2..4.1, 2..4.2 3.2..1, 3.2.2, 3.2.3 4.2.1, 4.2.2	Lectures and practical training, brain storming	Written, practical and oral exams
Week # 10	Pharmacological actions of drugs acting on GIT(cont.)	1.1.3 2.1.1, 2.3.1, 2.3.2, ,2..4.1, 2..4.2 3.2..1, 3.2.2, 3.2.3 4.2.1, 4.2.2	Lectures and practical training, case study, brain storming	Written, practical and oral exams
Week # 11	Pharmacological actions of drugs acting on GIT(cont.)	1.1.3 2.1.1, 2.3.1, 2.3.2, ,2..4.1, 2..4.2 3.2..1, 3.2.2, 3.2.3 4.2.1, 4.2.2	Lectures and practical training, case study, brain storming	Written, practical and oral exams
Week # 12	Pharmacological actions of drugs acting on GIT(cont.)	1.1.3 2.1.1, 2.3.1, 2.3.2, ,2..4.1,	Lectures and practical training, case study	Written, practical and oral exams

		2..4.2 3.2..1, 3.2.2, 3.2.3 4.2.1, 4.2.2		
Week # 13	Pharmacological actions of drugs acting on blood and respiratory system	1.1.5 2.1.1, 2.3.1, 2.4.2 3.2.1, 3.2.2, 3.2.3 4.2.1, 4.2.2	Lectures and practical training, case study	Written, practical and oral exams
Week # 14	Autacoids	1.1.2 2.1.1, 2.3.1, 2..4.2 3.2.1, 3.2.2, 3.2.3 4.2.1, 4.2.2	Lectures, brain storming, case study	Written and oral exams
Week # 15	Revision		Lectures, discussion and brain storming	Written and oral exams

Name and Signature
Course Coordinator
Prof. Dr. Sherin Zakaria

Name and Signature
Program Coordinator

Prof. Dr. Abdel Aziz El-Ashmawy

Kafrelsheikh University
Faculty of Pharmacy

جامعة كفر الشيخ
كلية الصيدلة

Course Specification
(2025)

1. Basic Information

Course Title (according to the bylaw)	Medicinal Chemistry II			
Course Code (according to the bylaw)	PC 605			
Department/s participating in delivery of the course	Pharmaceutical Chemistry Department			
Number of credit hours/points of the course (according to the bylaw)	Theoretical	Practical	Other (specify)	Total
	2	1	--------	3
Course Type	Compulsory			
Academic level at which the course is taught	Third level, Semester (2)			
Academic Program	Bachelor of Pharmacy (PharmD)			
Faculty/Institute	Faculty of Pharmacy			
University/Academy	Kafrelsheikh University			
Name of Course Coordinator	Associate. Prof. Tamer Mohamed Ibrahim			
Course Specification Approval Date	9/2025			
Course Specification Approval	Department Council			

2. Course Overview (Brief summary of scientific content)

This course covers the relationship of chemical structure to biological activity and the general structural features required for the drug action, the effect of molecular modifications on the absorption, distribution, metabolism, and target binding of drugs, Drugs acting on CNS and CVS. Antihistamines, GIT drugs, PPIs, Anticancer drugs, Opioids, Local anesthetics, Hypoglycemic drugs, Muscle relaxants, non-steroidal anti-inflammatory drugs (NSAIDs) and Disease Modified Antirheumatic drugs (DMARDs) and pharmacopeial methods of assay for drugs in different dosage forms.

3. Course Learning Outcomes CLOs

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

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		**Course Learning Outcomes** Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
Domain 1 (Fundamental Knowledge) **1.1-COMPETENCY**		**Upon completing this course, students will be able to integrate knowledge from basic and applied pharmaceutical and clinical sciences to standardize materials, formulate and manufacture products, and deliver population and patient-centered care.** **This competency will be developed via the following key elements:**	
1.1.1	Demonstrate understanding of knowledge of pharmaceutical, biomedical, social, behavioral, administrative, and clinical sciences.	**1.1.1**	Explain the chemical structures, functional groups, and physicochemical properties of drug classes studied in Medicinal Chemistry
		1.1.2	Relate chemical structure to pharmacological activity, mechanism of action, and therapeutic applications.
		1.1.3	Interpret how physicochemical and pharmacokinetic properties influence drug absorption, distribution, metabolism, and excretion (ADME).
1.1.3	Integrate knowledge from fundamental sciences to handle, identify, extract, design, prepare,	**1.1.4**	Interpret structure–activity relationships (SAR) to predict biological activity and guide molecular modification.

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**
	analyze, and assure quality of synthetic/natural pharmaceutical materials/products.	**1.1.5**	Apply chemical and analytical methods for identification and quality assurance of studied pharmaceuticals.
		1.1.6	Discuss synthetic pathways and isolation methods for selected drug molecules from natural and synthetic sources.
1.1.6	Utilize scientific literature and collect and interpret information to enhance professional decisions.	**1.1.7**	Critically evaluate research articles discussing synthesis, SAR, and pharmacological properties of drugs.
		1.1.8	Use literature to propose potential chemical modifications to improve drug activity or reduce side effects.
DOMAIN 2: PROFESSIONAL AND ETHICAL PRACTICE 2-2- COMPETENCY		**Upon completing this course, students will be able to standardize pharmaceutical materials, formulate and manufacture pharmaceutical products, and participate in systems for dispensing, storage, and distribution of medicines.** **This competency will be developed via the following key elements:**	
2.2.1	Isolate, design, identify, synthesize, purify, analyze, and standardize synthetic/natural pharmaceutical materials.	**2.2.1**	Outline synthetic schemes for target drug molecules studied in the course.
		2.2.2	Describe analytical methods for confirming the identity and purity of pharmaceuticals.
		2.2.3	Apply SAR knowledge to modify existing drugs for improved therapeutic profiles.
2.2.2	Apply the basic requirements of quality management system in developing, manufacturing, analyzing, storing, and distributing pharmaceutical materials/ products considering various incompatibilities.	**2.2.4**	Identify stability issues and incompatibilities in drug molecules based on their chemical structure.
		2.2.5	Discuss storage conditions for maintaining the stability of labile drugs.
2.2.3	Recognize the principles of various tools and instruments and select the proper techniques for synthesis and	**2.2.6**	Identify instrumental methods used in structural elucidation (e.g., NMR, IR, MS) of studied drugs.

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**
	analysis of different materials and production of pharmaceuticals.	**2.2.7**	Explain how analytical tools support SAR and drug design.
		2.2.8	Interpret instrumental data for verification of drug identity and purity.
2.2.4	Adopt the principles of pharmaceutical calculations, biostatistical analysis, bioinformatics, pharmacokinetics, and biopharmaceutics and their applications in new drug delivery systems, dose modification, bioequivalence studies, and pharmacy practice.	**2.2.9**	Apply basic pharmacokinetic calculations to predict drug behavior based on structure.
		2.2.10	Relate physicochemical parameters (e.g., pKa, logP) to drug absorption and distribution.
		2.2.11	Discuss examples of drug delivery modifications based on medicinal chemistry principles.
2-3- COMPETENCY		**Upon completing this course, students will be able to handle and dispose of biological and synthetic/natural pharmaceutical materials/products effectively and safely with respect to relevant laws and legislations.** **This competency will be developed via the following key elements:**	
2.3.1	Handle, identify, and dispose biologicals, synthetic/natural materials, biotechnology-based and radio-labeled products, and other materials/products used in pharmaceutical field	**2.3.1**	Identify labeling and storage requirements for hazardous medicinal compounds.
		2.3.2	Follow environmental and safety regulations during experimental work.
2.3.2	Recognize and adopt ethical, legal, and safety guidelines for handling and disposal of biological and pharmaceutical materials/products.	**2.3.3**	Demonstrate adherence to laboratory safety rules in handling pharmaceuticals.
		2.3.4	Discuss ethical considerations in medicinal chemistry research and drug development.
		2.3.5	Apply proper waste disposal methods for environmentally hazardous chemicals
2-4- COMPETENCY		**Upon completing this course, students will be able to actively share professional decisions and proper actions to save patient's life in emergency situations including**	

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**
		poisoning with various xenobiotics and effectively work in forensic fields. **This competency will be developed via the following key elements:**	
2.4.3	Take actions to solve any identified medicine-related and pharmaceutical care problems .	**2.4.1**	Identify chemical causes of drug instability or incompatibility.
		2.4.2	Propose structural modifications to overcome resistance or reduce side effects.
		2.4.3	Suggest alternative therapeutic agents based on SAR analysis.
		2.4.4	Apply medicinal chemistry knowledge to interpret and address adverse drug reaction mechanisms.
2-5- COMPETENCY		**Upon completing this course, students will be able to contribute to pharmaceutical research studies and clinical trials needed to authorize medicinal products** **This competency will be developed via the following key elements:**	
2.5.1	Fulfill the requirements of the regulatory framework to authorize a medicinal product including quality, safety, and efficacy requirements.	**2.5.1**	Explain preclinical chemical characterization required for drug registration.
		2.5.2	Relate structural features to safety and efficacy assessment.
		2.5.3	Identify documentation requirements for chemical quality assurance in regulatory submissions.
2.5.3	Contribute in planning and conducting research studies using appropriate methodologies.	**2.5.4**	Formulate a research question related to drug design or SAR.
		2.5.5	Select appropriate experimental or computational methods to address the research problem.

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	**Text**	**Code**	**Text**
		2.5.6	Present medicinal chemistry research findings in a scientific format.
DOMAIN 3: Pharmaceutical Care 3-2- COMPETENCY		**Upon completing this course, students will be able to provide counselling and education services to patients and communities about safe and rational use of medicines and medical devices. This competency will be developed via the following key elements:**	
3.2.1	Integrate the pharmacological properties of drugs including mechanisms of action, therapeutic uses, dosage, contra-indications, adverse drug reactions and drug interactions	**3.2.1**	Explain the mechanism of action of each drug class studied in relation to its chemical structure.
		3.2.2	Interpret how structural modifications can alter side effect profiles and drug interactions.
3.2.2	Apply the principles of clinical pharmacology and pharmacovigilance for the rational use of medicines and medical devices.	**3.2.3**	Discuss how chemical structure influences clinical efficacy and safety monitoring.
		3.2.4	Apply medicinal chemistry knowledge to guide drug selection in special populations.
		3.2.5	Evaluate reported adverse reactions in relation to drug structure and metabolism.
DOMAIN 4: Personal Practice 4-2- COMPETENCY		**Upon completing this course, students will be able to effectively communicate verbally, non-verbally and in writing with individuals and communities. This competency will be developed via the following key elements:**	
4.2.2	Use contemporary technologies and media to demonstrate effective presentation skills.	**4.2.1**	Prepare scientific presentations explaining SAR and synthesis of drugs.
		4.2.2	Use molecular modeling software to visually present drug–target interactions.
		4.2.3	Create digital posters or infographics summarizing medicinal chemistry topics.
		4.2.4	Deliver oral presentations integrating chemical and pharmacological data effectively.

4. Teaching and Learning Methods

1. **Lectures** (√)
2. **E-learning** (√)
3. **Practical training/ laboratory** (√)
4. **Discussion** (√)
5. **Brainstorming** (√)
6. **Assignments** (√)
7. **Case study** (√)
8. **Seminars** (√)

Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours			
			Theoretical teaching (lectures/ discussion groups/ .....)	Training (Practical/ Clinical/ .....)	Self-learning (Tasks/ Assignments/ Projects/ ...)	Other (to be determined)
1	Drugs acting on CNS	**4**	**2**	**2**	**---**	**---**
2	Drugs acting on CNS (cont.)	**4**	**2**	**2**	**---**	**---**
3	Drugs acting on Neurodegenerative disorders	**4**	**2**	**2**	**---**	**---**
4	Non-steroidal anti-inflammatory drugs (NSAIDs)	**4**	**2**	**2**	**---**	**---**
5	Non-steroidal anti-inflammatory drugs (NSAIDs) (cont.) and Disease Modified Antirheumatic drugs (DMARDs)	**4**	**2**	**2**	**---**	**---**
6	Chemistry of opioids	**4**	**2**	**2**	**---**	**---**
7	**Periodical exam**					
8	Chemistry of opioids (cont.)	**4**	**2**	**2**	**---**	**---**
9	Local anesthetics	**4**	**2**	**2**	**---**	**---**
10	Anticancer drugs	**4**	**2**	**2**	**---**	**---**
11	Anticancer drugs (cont.)	**4**	**2**	**2**	**---**	**---**
12	Anticancer drugs (cont.)	**4**	**2**	**2**	**---**	**---**
13	Hypoglycemic drugs	**4**	**2**	**2**	**---**	**---**
14	Muscle relaxants	**2**	**2**	**Practical exam**		
15	Revision	**2**	**2**	**Practical exam**		

5. Methods of students' assessment

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

6. Learning Resources and Supportive Facilities

Learning resources (books, scientific references, etc.)	**The main (essential) reference for the course**	Notes on medicinal chemistry 2 prepared and distributed by the Department of Pharmaceutical Chemistry. Lab Manual of Medicinal Chemistry 2, prepared and distributed by the Department of Pharmaceutical Chemistry.
	Other References	Wilson and Gisvold's " Textbook of Organic and Pharmaceutical Chemistry", 12th Ed., Jaime N. Delgado, J.B. Lippincot Co., 2010. William O Foye, " Principle of Medicinal Chemistry" 8th edition (2019), Williams & Wilkins, London
	Electronic Sources	www.medscape.com http://www.sciencedirect.com/ https://pubmed.ncbi.nlm.nih.gov/
	Learning Platforms	https://lms3.kfs.edu.eg/pharm/login/index.php
	Other	
Supportive facilities & equipment for teaching	**Devices/Instruments**	Data show, Computers, Library, Internet, Interactive boards and a distant learning unit
	Supplies	Classrooms.

and learning	**Skill Labs/ Simulators**	**----------**

Course Plan

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

Course title: Medicinal Chemistry II **Course code: PC 605**

Course Contents		Key elements	Teaching and Learning Methods	Student Assessment Methods
Week # 1	**Drugs acting on CNS**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.2.10, 2.2.11, 2.3.1, 2.3.2, 2.3.3, 2.3.4, 2.3.5, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 2.5.5, 2.5.6.	Lectures, E-learning practical training, and class activities	Written, practical and oral exams
Week # 2	**Drugs acting on CNS (cont.)**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.2.10, 2.2.11, 2.3.1, 2.3.2, 2.3.3, 2.3.4, 2.3.5, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 2.5.5, 2.5.6.	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
Week # 3	**Drugs acting on Neurodegenerative disorders**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.2.10, 2.2.11, 2.3.1, 2.3.2, 2.3.3, 2.3.4, 2.3.5, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 2.5.5, 2.5.6.	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
Week # 4	**Non-steroidal anti-inflammatory drugs (NSAIDs)**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.2.10, 2.2.11, 2.3.1, 2.3.2, 2.3.3, 2.3.4, 2.3.5, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 2.5.5, 2.5.6.	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
Week # 5	**Non-steroidal anti-inflammatory drugs (NSAIDs) (cont.) and Disease Modified Antirheumatic drugs (DMARDs)**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.2.10, 2.2.11, 2.3.1, 2.3.2, 2.3.3, 2.3.4, 2.3.5, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 2.5.5, 2.5.6.	Lectures, E-learning, practical training and class activities	Written, practical and oral exams

Week # 6	**Chemistry of opioids**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.2.10, 2.2.11, 2.3.1, 2.3.2, 2.3.3, 2.3.4, 2.3.5, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 2.5.5, 2.5.6.	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
Week # 7	**Periodical exam**			
Week # 8	**Chemistry of opioids (cont.)**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.2.10, 2.2.11, 2.3.1, 2.3.2, 2.3.3, 2.3.4, 2.3.5, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 2.5.5, 2.5.6.	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
Week # 9	**Local anesthetics**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.2.10, 2.2.11, 2.3.1, 2.3.2, 2.3.3, 2.3.4, 2.3.5, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 2.5.5, 2.5.6.	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
Week # 10	**Anticancer drugs**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.2.10, 2.2.11, 2.3.1, 2.3.2, 2.3.3, 2.3.4, 2.3.5, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 2.5.5, 2.5.6.	Lectures, E-learning, practical training and class activities	Written, practical and oral exams
Week # 11	**Anticancer drugs (cont.)**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.2.10, 2.2.11, 2.3.1, 2.3.2, 2.3.3, 2.3.4, 2.3.5, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 2.5.5, 2.5.6.	Lectures, E-learning, practical training, seminars and class activities	Written, practical and oral exams
Week # 12	**Anticancer drugs (cont.)**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.2.10, 2.2.11, 2.3.1, 2.3.2, 2.3.3, 2.3.4, 2.3.5, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 2.5.5, 2.5.6.	Lectures, E-learning, seminars and practical training	Written, practical and oral exams

Week # 13	**Hypoglycemic drugs**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.2.10, 2.2.11, 2.3.1, 2.3.2, 2.3.3, 2.3.4, 2.3.5, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 2.5.5, 2.5.6.	Lectures and E-learning	Written, practical and oral exams
Week # 14	**Muscle relaxants**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.2.10, 2.2.11, 2.3.1, 2.3.2, 2.3.3, 2.3.4, 2.3.5, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 2.5.5, 2.5.6.	Lectures and E-learning	Written and oral exams
Week # 15	**Revision**	1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.2.10, 2.2.11, 2.3.1, 2.3.2, 2.3.3, 2.3.4, 2.3.5, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, 2.5.5, 2.5.6.	Lectures and E-learning	Written and oral exams

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