

COURSE SPECIFICATIONS

Faculty of Pharmacy

Third Year – First Term

2018-2019

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**COURSE
SPECIFICATIONS**

**Biopharmaceutics and
Pharmacokinetics**

**Third year – first Term
2018-2019**

Course specification of Biopharmaceutics and Pharmacokinetics

University: Zagazig **Faculty:** Pharmacy

A- Course specifications:

Program (s) on which the course is given: Bachelor of pharmacy

Major or Minor element of programs: Major

Department offering the program: -----

Department offering the course: Pharmaceutics Department

Academic year Level: Third year/First semester

Date of specification approval: 3September 2018

B- Basic information:

Title: Biopharmaceutics and pharmacokinetics Code: PC314

Credit Hours: ---

Lectures: 2 hrs/week

Practical: 2hrs/week

Tutorials: ---

Total: 3 hrs/week

C- Professional information:

1-Overall aim of the course

On completion of the course, the student will be able to describe different orders of chemical reactions, the principles of biopharmaceutics including drug absorption, distribution, metabolism and excretion as well as pharmacokinetics principles.

2- Intended Learning Outcomes of biopharmaceutics and pharmacokinetics (ILO's):

A- Knowledge and Understanding	
a1	Enumerate different factors affecting drug stability
a2	Describe the effects of different factors on the rate of absorption, distribution, biotransformation and elimination of drugs.
a3	Illustrate different pharmacokinetic parameters and bioavailability
a4	Summarize methods of determination of pharmacokinetic parameters and order of reactions
B- Professional and Practical skills	
b1	Calculate rate constants and half lives of chemical reactions
b2	Calculate absorption and elimination parameters following oral administration and IV infusion
b3	Calculate drug pharmacokinetic parameters including Cl, Vd, T1/2
C- Intellectual skills	
c1	Differentiate between one compartmental and multiple compartmental models of drug distribution
c2	Interpret different drug pharmacokinetic data following oral administration and IV infusion
C3	Predict different factors affecting drug bioavailability
D- General and Transferable skills	
d1	Use information technology to collect and present data
d2	Develop self learning skills
d3	Deliver course activities in due time
d4	Work effectively as a member of a team

D- Contents:

Week No.	Lecture contents (2hrs/week)	Practical session (2hrs/week)
1	Types of orders of chemical reactions: Zero order First order Second order	Types of orders of chemical reactions
2	<ul style="list-style-type: none"> • Determination of the order of chemical reaction • Factors affecting drug stability • Accelerated stability testing 	Problem solving
3	One compartmental model of drug distribution	IV bolus one compartmental model
4	Two compartmental model of drug distribution	Problem solving
5	Drug pharmacokinetics following single oral drug administration	Drug pharmacokinetics following single oral dose
6	Steady state principle after constant iv infusion	Drug pharmacokinetics following single oral dose
7	Midterm exam	
8	Drugs Absorption - Passage of drugs across membranes - Membrane Structure - Methods of passage of drugs across cell membranes - Passive Diffusion - Factors affecting Passive absorption - Acidity & Base ionization - Lipid & water solubility of drugs - Active Diffusion - Specialized transport of drugs	Calculation of absorption rate constant
9	Factors affecting drug absorption	Problem solving
10	Distribution of drugs: - Importance of blood flow to tissues - Role of blood brain barrier - Placental transfer of drugs - Mammary transfer of drugs - Redistribution of drugs - Role of plasma protein binding & importance	Bioavailability and bioequivalence
11	Drugs Metabolism - Sites of drug metabolism - Relationships of phase I and phase II reactions in drug biotransformation - Phase I reactions - Phase II reactions - Enzyme induction - Enzyme inhibition	Steady state principle after constant IV infusion

12	<ul style="list-style-type: none"> - Effects of genetic factors on biotransformation - Effects of environmental factors on biotransformation - Effects of age and sex on biotransformation - Drug-drug interactions during metabolism - Effects of diseases on drug biotransformation 	Steady state principle after multiple IV infusion (Delivery of activity report)
13	Drug excretion	Practical exam
14	Revision and open discussion	
15	Final written exam	

E- Teaching and Learning Methods:

- Lectures
- Practical session (problem solving)
- Self learning: Report preparation about pharmacokinetics of certain drugs

F- Student Assessment methods:

1-Written exams to assess: a1, a2, a3, a4, c1, c2, c3

2- Activity to assess: d1, d2, d3, d4

3-Practical exams to assess: b1, b2, b3

4-Oral exam to assess: a1, a2, a3, a4, c1, c2, c3

Assessment schedule

Assessment (1): midterm exam	Week 7
Assessment (2): final Written exam	Week 15
Assessment (3): Activity	Week 12
Assessment (3): Practical exams	Week 13
Assessment (4): Oral exams	Week 15

Weighting of Assessment

Assessment method	Marks	Percentage
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midterm exam	10	10%
Final Written exam	50	50%
Practical exam	20	20%
Oral exam	15	15%
Activity	5	5%
TOTAL	100	100%

G- Facilities required for teaching and learning:

For lectures: Black (white) boards, data show

For labs: well aerated and well seated labs

H- List of References:

1- Course Notes: Student book of Biopharmaceutics and pharmacokinetics approved by pharmaceuticals department (2018)

2- Essential Books:

Basic & Clinical Pharmacokinetics by Micheal E. Winter published by Lippincott and Williams. 4th Edition.

Malcolm Rowland & Thomas N. Tozer, Clinical Pharmacokinetics Concepts and Applications 3rd ed. Lea & Febiger Philadelphia, 1995

Milo Gibaldi, Biopharmaceutics and Clinical Pharmacokinetics, 4th ed. Lea & Febiger, Philadelphia 1991

3- Recommended Books

www.speciation.net Applied Biopharmaceutics & Pharmacokinetics
Leon Shargel/Andrew Yu, 5th Edition, Appletton & Lange

4- Periodicals and websites:

Animations from www.icp.org.nz are used in this course to enhance students learning as class room discussion.

www.boomer.org

Course Coordinator: Dr. Gehan Fathy Attia

- Head of Department: Prof. Nagia Ahmed El-Megrab
Date: تم مناقشة و اعتماد توصيف المقرر من مجلس القسم بتاريخ 9 / 2018 م

Matrix I of Biopharmaceutics and Pharmacokinetics Course

Course Contents		ILOs of Biopharmaceutics and Pharmacokinetics course													
		Knowledge and understanding				Professional and practical skills			Intellectual skills			Transferable and general skills			
Lectures		a1	a2	a3	a4	b1	b2	b3	c1	c2	c3	d1	d2	d3	d4
1	Types of orders of chemical reactions: Zero order First order Second order				x										
2	<ul style="list-style-type: none"> Determination of the order of chemical reaction Factors affecting drug stability Accelerated stability testing 	x													
3	One compartmental model of drug distribution			x	x				x						
4	Two compartmental model of drug distribution			x	x				x						
5	Drug pharmacokinetics following single oral drug administration			x	x					x					
6	Steady state principle after constant iv infusion			x	x					x	x				
7	Drugs Absorption - Passage of drugs across membranes - Membrane Structure - Methods of passage of drugs across cell membranes - Passive Diffusion - Factors affecting Passive absorption - Acidity & Base ionization - Lipid & water solubility of drugs		x								x				

	- Active Diffusion - Specialized transport of drugs													
8	Factors affecting drug absorption		x							x				
9	Distribution of drugs: - Importance of blood flow to tissues - Role of blood brain barrier - Placental transfer of drugs - Mammary transfer of drugs - Redistribution of drugs - Role of plasma protein binding & importance		x											
10	Drugs Metabolism - Sites of drug metabolism - Relationships of phase I and phase II reactions in drug biotransformation - Phase I reactions - Phase II reactions - Enzyme induction - Enzyme inhibition		x						x		x			
11	- Effects of genetic factors on biotransformation - Effects of environmental factors on biotransformation - Effects of age and sex on biotransformation - Drug-drug interactions during metabolism - Effects of diseases on drug biotransformation		x								x			
12	Drug excretion		x											

Practical Sessions															
13	Types of orders of chemical reactions					x							x	x	x
14	IV bolus one compartmental model						x						x	x	x
15	Drug pharmacokinetics following single oral dose							x					x	x	x
16	Calculation of absorption rate constant						x						x	x	x
17	Bioavailability and bioequivalence							x					x	x	x
18	Steady state principle after constant IV infusion						x						x	x	x
19	Steady state principle after multiple IV infusion						x						x	x	x
20	Drug elimination							x					x	x	x
21	Activity											x	x	x	x

Matrix II of Biopharmaceutics and Pharmacokinetics course

Matrix II of Biopharmaceutics and Pharmacokinetics course											
National Academic Reference Standards (NARS)		Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods			Method of assessment		
						Lecture	Practical session	Self learning	Written exam	Practical exam	Oral exam
2.1	Principles of basic, pharmaceutical, medical, social, behavioral, management, health and environmental sciences as well as pharmacy practice.	A2	a1	Determination of the order of chemical reaction •Factors affecting drug stability •Accelerated stability testing							
2.8	Principles of pharmacokinetics and biopharmaceutics with applications in therapeutic drug monitoring, dose modification and bioequivalence studies.	A.19	a2	Drugs Absorption - Passage of drugs across membranes - Membrane Structure - Methods of passage of drugs across cell membranes - Passive Diffusion - Factors affecting Passive absorption - Acidity & Base ionization - Lipid & water solubility of drugs - Active Diffusion	Student book Essential books	x			x	x	

Factors affecting drug absorption	Student book Essential books	x			x		x
Distribution of drugs: - Importance of blood flow to tissues - Role of blood brain barrier - Placental transfer of drugs - Mammary transfer of drugs - Redistribution of drugs - Role of plasma protein binding & importance	Student book Essential books	x			x		x
Drugs Metabolism - Sites of drug metabolism - Relationships of phase I and phase II reactions in drug biotransformation - Phase I reactions - Phase II reactions - Enzyme induction - Enzyme inhibition	Student book Essential books	x			x		x
Effects of genetic factors on biotransformation - Effects of environmental factors on biotransformation - Effects of age and sex on biotransformation - Drug-drug interactions during metabolism - Effects of diseases on drug biotransformation	Student book Essential books	x			x		x

				Drug excretion	Student book Essential books	x			x			x			
			a3	One compartmental model of drug distribution	Student book Essential books	x			x			x			
				Two compartmental model of drug distribution											
				Drug pharmacokinetics following single oral drug administration	Student book Essential books	x				x			x		
				Steady state principle after constant iv infusion											
2.17	Methods of biostatistical analysis and pharmaceutical calculations	A36	a4	Types of orders of chemical reactions: Zero order First order Second order	Student book Essential books	x			x			x			
4.10	Calculate and adjust dosage and dose regimen of medications.	C15	b1	Types of orders of chemical reactions	Practical notes			x				x			
			b2	IV bolus one compartmental model	Practical notes			x					x		
			b3	Drug pharmacokinetics following single oral dose	Practical notes			x						x	
				Calculation of absorption rate constant	Practical notes			x						x	
				Bioavailability and bioequivalence	Practical notes			x						x	
				Steady state principle after constant IV infusion	Practical notes			x						x	

				Steady state principle after multiple IV infusion	Practical notes		x		x	
				Drug elimination	Practical notes		x		x	
4.13	Analyze and interpret experimental results as well as published literature	C18	c1	One compartmental model of drug distribution	Student book Essential books	x		x		x
				Two compartmental model of drug distribution						
			c2	Drug pharmacokinetics following single oral drug administration	Student book Essential books	x		x		x
				Steady state principle after constant iv infusion	Student book Essential books	x		x		x
			C3	Different absorption, distribution, metabolism and elimination processes	Student book Essential books	x		x		x
5.3	Work effectively in a team.	D3	d4	Types of orders of chemical reactions	Practical notes		x		x	

5.8	Demonstrate creativity and time management abilities.	D9	d3	IV bolus one compartmental model	Practical notes		x		x	
5.4	Use numeracy, calculation and statistical methods as well as information technology tools. Implement writing and thinking, problem- solving and decision- making abilities.	D.5	d1	Drug pharmacokinetics following single oral dose	Practical notes		x		x	
5.10		D.11	d2	Calculation of absorption rate constant	Practical notes		x		x	
				Bioavailability and bioequivalence	Practical notes and Internet		x		x	
Steady state principle after constant IV infusion	Practical notes				x		x			

Course Coordinator: Dr. GehanFathyAttia

• Head of Department: Prof. Nagia Ahmed El-Megrab

Date: تم مناقشة و اعتماد توصيف المقرر من مجلس القسم بتاريخ 9 / 2018 م

**COURSE
SPECIFICATIONS**

**Chromatography of
Natural Products**

**Third year – first Term
2018-2019**

Course Specification of: Chromatography of Natural Products

University: **Zagazig** Faculty: **Pharmacy**

A- Course specifications:

Program(s) on which the course is given: **Bachelor of Pharmacy**

Major or Minor element of programs: **Major**

Department offering the program:

Department offering the course: **Pharmacognosy Department.**

Academic year/Level: **Third year /First term**

Date of specification approval: **9/2018**

B- Basic information:

Title: **Chromatography of Natural Products**

Code: **PG 313**

Credit Hours: **---**

Lectures : **2 hrs/week**

Practical: **2 hr/week**

Tutorials: **---**

Total: **3 hrs/week**

C- Professional information:

1-Overall Aims of the Course:

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

Illustrate the different techniques for extraction, purification and isolation of biologically active constituents of plants or animal origin based on their phytochemical natures.

2-Intended Learning Outcomes (ILOs):

A- Knowledge and Understanding	
a1	Outline the principle of extraction, purification and identification of herbal drugs.
a2	Enumerate the different chromatographic separation techniques.
a3	Illustrate the principles of different chromatographic techniques.
B- Professional and Practical skills	
b1	Handle basic laboratory equipments effectively and safely.
b2	Perform laboratory techniques for extraction, isolation and identification of different classes of natural products.
b3	Construct a research study about different chromatographic techniques.
C- Intellectual skills	
c1	Predict different analytical tools used for determination of naturally occurring constituents qualitatively and quantitatively.
c2	Select appropriate chromatographic methods for isolation and identification of different classes of secondary metabolites from natural origin.
c3	Compare between the efficiency of different chromatographic techniques in the isolation of different classes of secondary metabolites from natural origin.
D- General and Transferable skills	
d1	Work effectively as a member of a team.
d2	Write reports and present it.
d3	Develop communications skills with systematic and creative thinking individually or among a team

D- Contents:

week No.	Lecture contents (2 hrs/lec.)	Practical session (2hrs/lab)
1	- General procedure for extraction and purification.	Laboratory safety measures Extraction of herbal drugs.
2	-Chromatography. -Introduction, classification, and terminology and mode of chromatographic separation.	Steam distillation of volatile oil containing plants. Sublimation and crystallization
3	-Adsorption chromatography. -Column chromatography.	Separation of dyes mixtures by column chromatography Video on operation of rotary evaporator.
4	-Thin layer chromatography and chromatotron.	<ul style="list-style-type: none"> • . Screening of dyes: TLC. Activity (1): (Topic distribution among groups for a research about a specific chromatographic technique and its application in the field of

		natural products)
5	-Partition chromatography -Paper chromatography.	Screening of plant extracts by TLC. Videos on the operation of chromatotron and counter current
6	-Non classical column chromatography. -Gas chromatography, principle, mobile phase, stationary phase.	Activity (1): follow up student progress in preparing their research, group discussion about difficulties faced them during preparation.
7	Midterm exam	
8	Gas chromatography, detectors, quantification and application.	Screening of dyes by paper chromatography. Videos on the operation of gel eletrophoresis
9	-HPLC, principle, mobile phase, stationary phase.	Screening of flavonoids by paper chromatography Activity (2): Demonstration of HPLC and GC in Faculty Central Lab
10	-HPLC, detectors, quantification and application.	Report presentation and group discussion on activity (2) .
11	-Ion exchange chromatography - Gel chromatography and affinity.	. Final presentation of activity (1)
12	-Supercritical fluid chromatography	Practical exam
13	- Electrophoresis.	
14	Revision	
15	Written exam	

E- Teaching and Learning Methods:

- Lectures
- Practical sessions
- Videos for machines not available for actual demonstration (Gel electrophoresis, rotary evaporator, counter current,)
- Self learning (group discussion, group assignment)

F- Student Assessment Methods:

- 1- Written exam (periodic, final) **to assess** (a1, a2, a3, c1, c2)
- 2- Activity (1): a research about a specific chromatographic

technique and its application in the field of natural products **to assess** (d1, d2, d3)

Activity (2): A visit to demonstrate HPLC and GC in Faculty central lab. and a report about student`s feedback is requested **to assess** (b3, d2, d3).

3- Practical exam **to assess** (b1, b2)

4- Oral exam **to assess** (a1, a2, a3, c1, c2, c3).

Assessment schedule:

Assessment (1): midterm exam	Week 7
Assessment (2): Activity	Week 4, 6, 9, 10, 11
Assessment (3): Practical exam	Week 12
Assessment (4): Final written exam	Week 15
Assessment (5): Oral exams	Week 15

Weighting of Assessment:

Assessment method	Marks	Percentage
Midterm exam	10	10%
Activity	5	5 %
Practical exam	20	20 %
Final written exam	50	50 %
Oral exam	15	15 %
TOTAL	100	100%

G- Facilities Required for Teaching and Learning:

- Black (white) board, Data show.
- Laboratory equipment (soxhlet apparatus, Clevenger, TLC plates, glass columns, sprayers, capillaries, jars, separating funnels)
- HPLC and GC machines in the faculty central lab.
- Chemicals (organic solvents, silica for column and TLC, spraying reagents, Plant powders, alkaloids, and flavonoids).

H- List of References:

1- Course Notes: Student book of third year approved by

Pharmacognosy Department

2- Essential Books:

i- Preparative Chromatography Techniques, Kurt Hostettmann, Maryse Hostettmann, Andrew Marston; Springer Science & Business Media (2013).

i- Comprehensive Natural Products Chemistry; Barton, D and Nakanishi, K, Elsevier Science Ltd.(1999)

ii- Natural Products Isolation; Canell, R. J. P, Humana Press. (1998).

iii- Chromatographic Analysis of pharmaceuticals; Adamovics, J. A; 2nd ed. (1997).

iv- Natural Products Chemistry;Torssel, K. B. G.: Apotekars. Press (1997)

3- Recommended Books

i- The Hand Books of Natural Flavonoids; Harborne, J., B. and Baxter, H.; John Wiley & Sons Ltd.(1999).

ii- Natural Products from Plants; Kaufmann, P. B *et al.* ;CRC Press (1999).

iii- vi- Preparative Chromatography Techniques; Application in Natural Products Isolation; Hostettmann, K. Marston, A, and Hostettmann, M. 2nd ed. Springer (1998)

iv- Pharmacognosy and Pharmacobiotechnology; Robbers, J. E., Speedie ,M. K. and Tyler. V. E.; Williams & Wilkins (1996).

4- Periodicals and websites:

Planta medica, Phytochemistry, J. of Natural Products, Die Pharmazie, Fitoterapia and journal of chromatography.

[http:// www.elsevier.com/phytochem](http://www.elsevier.com/phytochem)

[http:// www.elsevier.com/phytomed](http://www.elsevier.com/phytomed)

[http:// www.wiley.co.uk.](http://www.wiley.co.uk)

[http:// bioweb@cellbiol.com](http://bioweb@cellbiol.com)

Course Coordinator: Prof. Dr. Fawkeya Abbas

Head of Department: Prof. Dr.

Date: م 9/ 2018 تم مناقشة و اعتماد توصيف المقرر من مجلس القسم بتاريخ

Matrix I of Chromatography of Natural Products Course

Course Contents		ILOs of Chromatography of Natural Products Course											
		Knowledge and understanding			Professional and practical skills			Intellectual skills			Transferable and general skills		
		a1	a2	a3	b1	b2	b3	c1	c2	c3	d1	d2	d3
Lectures													
1	- General procedure for extraction and purification.	×											
2	- Chromatography.		×										
3	- Introduction, classification, and terminology and mode of chromatographic separation.		×										
4	- Adsorption chromatography.			×									
5	- Column chromatography.			×									
6	- Thin layer chromatography and chromatotron.			×									
7	- Partation chromatography			×									
8	- Paper chromatography.			×									

9	- Non classical column chromatography.			×									
10	- Gas chromatography, principle, mobile phase, stationary phase.			×					×				
11	- Gas chromatography, detectors, quantification and application.			×					×				
12	- HPLC, principle, mobile phase, stationary phase.			×					×				
13	- HPLC, detectors, quantification and application.			×					×				
14	- Ion exchange chromatography			×									
15	- Gel chromatography and affinity.			×									
16	- Supercritical fluid chromatography.			×									
17	- Electrophoresis.			×									
Practical sessions													
18	- Laboratory safety measures				×								
19	- Extraction of herbal drugs.					×	×						
20	- Steam distillation of volatile oil containing plants.					×	×						
21	- Sublimation and crystallization.					×	×						

22	- Separation of dyes mixtures by column chromatography.					×	×			×			
23	Video on operation of rotary evaporator.	×				×	×						
24	- Screening of dyes by TLC.					×	×	×		×			
25	A group research on a specific chromatographic technique and its application in the field of natural products		×	×							×	×	×
26	- Screening of plant extracts by TLC.					×	×	×		×			
27	- Screening of dyes by paper chromatography.					×	×			×			
28	Video on CCC, chromatotron and Electrophoresis		×	×		×	×						
29	- Screening of flavonoids by paper chromatography					×	×			×			
30	- Demonstration of HPLC and GC in Faculty central lab. A report about student`s feedback is requested		×	×		×	×			×		×	

Matrix II of Chromatography of Natural Products Course

National Academic Reference Standards (NARS)	Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods			Weighting of assessment				
					Lecture	Practical session	Self learning	Written exams	Practical exam	Oral exam	Activities	
Knowledge and Understanding												
2.1	Principles of basic, pharmaceutical, medical, social, behavioral, management, health and environmental sciences as well as pharmacy practice.	A2	a1	- General procedure for extraction and purification.	Student's book	x			x		x	
			a2	- Chromatography	Student's book	x			x		x	
				- Introduction, classification, and terminology and mode of chromatographic separation.	Student's book	x			x		x	
2.4	Principles of isolation, synthesis, purification, identification, and standardization methods of pharmaceutical compounds.	A12	a3	- Adsorption chromatography.	Student's book	x			x		x	
				- Column chromatography.	Student's book	x			x		x	
				- Thin layer chromatography and chromatotron.	Student's book	x			x		x	

				- Partation chromatography	Student's book	x				x		x	
				- Paper chromatography.	Student's book	x				x		x	
				- Non classical column chromatography.	Student's book	x				x		x	
				- Gas chromatography, principle, mobile phase, stationary phase.	Student's book	x				x		x	
				- Gas chromatography, detectors, quantification and application.	Student's book	x				x		x	
				- HPLC, principle, mobile phase, stationary phase.	Student's book	x				x		x	
				- HPLC, detectors, quantification and application.	Student's book	x				x		x	
				- Ion exchange chromatography	Student's book	x				x		x	

				- Gel chromatography and affinity.	Student's book	x			x		x	
				- Supercritical fluid chromatography.	Student's book	x			x		x	
				- Electrophoresis.	Student's book	x			x		x	
Professional and Practical Skills												
3.2	Handle and dispose chemicals and pharmaceutical preparations safely	B2	b1	- Laboratory safety measures	Practical notes		x				x	
3.4	Extract, isolate, synthesize, purify, identify, and /or standardize active substances from different origins	B6	b2	- Extraction of herbal drugs.	Practical notes		x				x	
				- Steam distillation of volatile oil containing plants.	Practical notes		x				x	
				- Sublimation and crystallization.	Practical notes		x				x	
				- Separation of dyes mixtures by column chromatography.	Practical notes		x				x	
				- Screening of dyesTLC.	Practical notes		x				x	
				- Screening of plant extracts by TLC .	Practical notes		x				x	

				- Screening of dyes by paper chromatography.	Practical notes		x				x		
				- Screening of flavonoids by paper chromatography	Practical notes		x				x		
3.8	Apply techniques used in operating pharmaceutical equipment & instrument	B 15	b2	Activity: Demonstration of HPLC and GC in Faculty central lab, A report about visit feedback is requested	Lab visit Internet Library		x				x		
			b3	Activity: Demonstration of HPLC and GC in Faculty central lab, A report about visit feedback is requested	Report about lab visit		x	x	x	x	x	x	x
3.11	Conduct research studies and analyze the results.	B19	b3	A group research on a specific chromatographic technique and its application in the field of natural products	Internet Library				x				x
Intellectual Skills													
4.5	Select appropriate methods of isolation, purification, identification of active substances from different origins.	C 9	c1 c2 c3	<ul style="list-style-type: none"> All course contents Activity 2: Demonstration of HPLC and GC in Faculty central lab, A report about visit feedback is requested 	Student's book Recommended book Internet		x	x	x	x	x	x	x

4.13	Analyze and interpret experimental results as well as published literature	C 18	c3	Activity 1 A group research on a specific chromatographic technique and its application in the field of natural products	Internet Library			x					x
General and Transferable Skills													
5.1	Communicate clearly by verbal means.	D 1	d3	Activity 1: A group research on a specific chromatographic technique and its application in the field of natural products	Internet Library			x					x
5.3	Implement tasks as a member of a team	D 3	d1		Internet Library			x					x
5.9	Implement writing and presentation skills.	D 10	d2		Internet Library Central lab visit			x					x

Course Coordinator: Prof. Dr. Fawkeya Abbas

Head of Department: Prof. Dr. Amal AlGendi

Date: تم مناقشة و اعتماد توصيف المقرر من مجلس القسم بتاريخ 9 / 2018 م



**COURSE
SPECIFICATIONS**

Pharmacology -1

**Third year – first Term
2018-2019**

Course Specification of Pharmacology I

University: Zagazig **Faculty:** Pharmacy

A- Course specifications:

Program(s) on which the course is given: **Bachelor of Pharmacy**

Major or Minor element of programs: Major

Department offering the program: -----

Department offering the course: **Pharmacology and toxicology department**

Academic year / Level: **Third year / first term**

Date of specification approval: October 2018

B- Basic information:

Title: pharmacology I Code: **PT 312**

Credit Hours:

Lectures: 3 hr/week

Practical: 2 hrs/week

Tutorials: ---

Total: 4 hrs/week

C- Professional information:

1-Overall Aims of the Course

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

- Define the principles of pharmacokinetics, pharmacodynamics and dose-response curve of drugs

- Identify pharmacological properties of drugs, affecting different body systems & organs.
- Integrate and link the knowledge of physiology and pharmacology for proper selection of drugs in various disease conditions.
- Implement tasks as a member of a team.

2-Intended Learning Outcomes of (ILOS)

A- Knowledge and Understanding	
a1	Define the basic concepts of pharmacokinetics and pharmacodynamics.
a2	Illustrate which drug is better for certain condition and certain patient.
a3	Describe the mechanism of action of a given drug.
a4	Mention adverse effects as well as drug-drug interaction for a given drug.
B- Professional and Practical Skills	
b1	Handle chemicals and biological samples safely.
b2	Compare and contrast the specific pharmacology of the different classes of drugs.
b3	Observe and record the effect of drugs on biological tissues
C- Intellectual Skills	
c1	Integrate and link information across course components, including material met in different years, from different disciplines like physiology, histology and anatomy for proper selection of drugs in various disease conditions.
c2	Analyze and interpret data correctly and confidently in different ways.
D- General and Transferable Skills	
d1	Work effectively as a member of a team.
d2	Write reports and present it.

D- Contents:

Week No.	Lecture (3 hrs/week)	Practical Session (2 hrs/week)
1	Introduction to pharmacology	Laboratory safety measures Drug development Types of pharmacological experiments
2	Pharmacokinetics	Laboratory safety measures Drug development Types of pharmacological experiments
3	Pharmacodynamics	Concentration-effect curve of acetylcholine using the isolated rabbit intestine muscle
4	Adverse drug reactions	Concentration-effect curve of acetylcholine using the isolated rabbit intestine muscle
5	Drug- drug interactions	Concentration-effect curve of atropine using the isolated rabbit intestine muscle
6	Autonomic nervous system	Concentration-effect curve of atropine using the isolated rabbit intestine muscle
7	Midterm exam	
8	Autonomic nervous system	Effects and sites of action of different drugs (stimulants or relaxants) on the isolated rabbit intestine muscle
9	Autonomic nervous system	Effects and sites of action of different drugs (stimulants or relaxants) on the isolated rabbit intestine muscle
10	Diuretics	Ups and Downs of pharmacology (activity report)
11	Antihypertensives	Ups and Downs of pharmacology
12	Arrhythmia	Practical exam
13	Heart failure	Practical exam
14	Angina	
15	Final exam	

E- Teaching and Learning Methods:

- Lectures

- Practical sessions
- Open discussion, self-learning.

F- Student Assessment Methods:

- 1- Written exam (midterm and final) to assess: a1, a2, a3, a4, c1, c2
- 2- Activity (report) to assess d1, d2
- 3- Practical exam to assess: b1, b2, b3, d1
- 4- Oral exam to assess: a1, a2, a3, a4, c1, c2

Assessment Schedule:

Assessment (1): Final written exam	15 Week
Assessment (2): Practical exam	12, 13 Weeks
Assessment (3): Oral exam	15 Week
Assessment (4): Midterm exam	7 Week
Assessment (5): Activity (report)	10 Week

Weighting of Assessment:

Assessment method	Marks	Percentage
Midterm exam	15	10%
Final written exam	75	50%
Activity (Report)	10	7%
Practical exam	30	20%
Oral exam	20	13%
TOTAL	150	100%

F- Facilities required for teaching and learning:

- Black (white) board, Data show, Laboratory equipment (water bath, kymograph, organ bath, thermometer) and Chemicals.

H- List of References:

1- Course Notes: Student book of Pharmacology I approved by Pharmacology department

2- Essential Books:

- Richard A. Harvey, [Michelle A. Clark](#), Lippincott's Illustrated Reviews

Pharmacology 5th ed. Lippincott Williams & Wilkins, 2012.

3- Recommended Books

- i- H.P.Rang,M.M.Dale,J.M.Ritter& R.J. Flower ed. RANG & DALE Pharmacology 6th 2008 Churchill 2. Livingstone Elsevier London.
- ii- Katzung, B.G., ed. Basic and Clinical Pharmacology. 9th ed. New York : McGraw Hill, 2006.
- iii- Bennet P.N., and M.J. Brown, eds. Clinical Pharmacology. 10th ed. London : Churchill Livingstone, 2006.
- iv- Hardman J.G., L.E. Limbrid, and A.G. Gilman, eds. Goodman & Gilman's the Pharmacological Basis of Therapeutics. 10th ed. New York : McGraw Hill, 2006.
- v- Luellmann H., L. Hein, K. Mohr, and D. Bieger. Color Atlas of Pharmacology. 3rd ed. Stuttgart : Thieme, 2005.
- vi- Brenner,G.M.andSteven,C.W., Pharmacology,3rd ed.,2010

4- Periodicals and websites:

- British J Pharmacol,
- European J Pharmacol,
- Pharmacology,
- Pharmacology and Toxicology

Pubmed.com

www.medconsult.com/www.pharmanet.com

Course Coordinator: Prof. Dr. Salah Gharib

Head of Department: Prof.Dr. Mona Fouad

Date: 2018/ / تم مناقشة و اعتماد توصيف المقرر من مجلس القسم بتاريخ

Matrix I												
Course Contents		ILOs of the course										
		Knowledge and understanding				Practical skills			Intellectual skills		General and transferable and skills	
		a1	a2	a3	a4	b1	b2	b3	c1	c2	d1	d2
Lectures												
1	Introduction to pharmacology	x							x	x		
2	Pharmacokinetics	x							x	x		
3	Pharmacodynamics	x							x	x		
4	Adverse drug reactions				x				x	x		
5	Drug- drug interactions				x				x	x		
6	Autonomic nervous system		X	x	x				x	x		
7	Midterm exam	x	X	x	x				x	x		
8	Autonomic nervous system		X	x	x				x	x		
9	Autonomic nervous system		X	x	x				x	x		
10	Diuretics		X	x	x				x	x		
11	Antihypertensives		X	x	x				x	x		
12	Arrhythmia		X	X	x				x	x		
13	Heart failure		X	X	x				x	x		

14	Angina		X	X	x				x	x		
Practical sessions												
1	Laboratory safety measures Drug development Types of pharmacological experiments					x	x	x			x	x
2	Laboratory safety measures Drug development Types of pharmacological experiments					x	x	x			x	x
3	Concentration-effect curve of acetylcholine using the isolated rabbit intestine muscle					x	x	x			x	x
4	Concentration-effect curve of acetylcholine using the isolated rabbit intestine muscle					x	x	x			x	x
5	Concentration-effect curve of atropine using the isolated rabbit intestine muscle					x	x	x			x	x
6	Concentration-effect curve of atropine using the isolated rabbit intestine muscle					x	x	x			x	x
7	Effects and sites of action of different drugs (x	x	x			x	x

	stimulants or relaxants) on the isolated rabbit intestine muscle											
8	Effects and sites of action of different drugs (stimulants or relaxants) on the isolated rabbit intestine muscle					x	x	x			x	x
9	Ups and Downs of pharmacology Activity (report)					x	x	x			x	x
10	Ups and Downs of pharmacology					x	x	x			x	x
11	Practical exam					x	x	x			x	x

Matrix II of Pharmacology I course

National Academic Reference Standards (NARS)		Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods			Method of assessment			
						Lecture	Practical session	Self-learning	Written exam	Practical exam	Midterm exam	Oral exam
2.1	Principles of basic, pharmaceutical, medical, social, behavioral, management, health and environmental sciences as well as pharmacy practice.	A2	a1	Pharmacokinetics and Pharmacodynamics.	Student book, Essential books	X			x		x	x
		A4	a1	Introduction to pharmacology.	Student book, Essential books	X			x		x	x
2.12	Etiology, epidemiology, laboratory diagnosis and clinical features of different diseases and their pharmacotherapeutic approaches.	A29	a2	Autonomic nervous system Diuretics Antihypertensives Arrhythmia Heart failure Angina	Student book, Essential books	X			x		x	x
2.13	Pharmacological properties of drugs including mechanisms of action, therapeutic uses, dosage, contra-	A30	a3	Autonomic nervous system Diuretics Antihypertensives Arrhythmia Heart failure Angina	Student book Essential books	X			x		x	x

	indications, ADRs and drug interactions.		a4	Drug-drug interaction Adverse drug reactions Autonomic nervous system Diuretics Antihypertensives Arrhythmia Heart failure Angina	Student book Essential books	X			x			x
3.2	Handle and dispose chemicals and pharmaceutical preparations safely	B2	b1	Laboratory safety measures	Practical notes		x			x		
3.4	Extract, isolate, synthesize, purify, identify, and /or standardize active substances from different origins.	B6	b2 b3	Drug development Types of pharmacological experiments Concentration-effect curve of acetylcholine using the isolated rabbit intestine muscle Concentration-effect curve of atropine using the isolated rabbit intestine muscle Effects and sites of action of different drugs (stimulants or relaxants) on the isolated rabbit intestine muscle Ups and Downs of pharmacology (activity report)	Practical notes		x			x		
4.9	Utilize the pharmacological basis of therapeutics in the proper selection and use of drugs in various	C14	c1	Introduction to pharmacology. Pharmacokinetics and Pharmacodynamics. Drug-drug interaction Adverse drug reactions	Student book Essential books	x			x			x

	disease conditions.			Autonomic nervous system Diuretics Antihypertensives Arrhythmia Heart failure Angina							
4.13	Analyze and interpret experimental results as well as published literature	C18	c2	Drug-drug interaction Adverse drug reactions Autonomic nervous system Diuretics Antihypertensives Arrhythmia Heart failure Angina	Student book Essential books	x		x			x
5.3	Work effectively in a team	D3	d1	Activity and practical session	Practical notes Recommended books Internet		X	x		x	
5.9	Implement writing and presentation skills	D10	d2	Activity and practical session	Practical notes Recommended books Internet		X	x		X	

Course Coordinator: Prof. Dr. Salah Gharieb

Head of Department: Prof. Dr. Mona Fouad

Date: 2018/ / تم مناقشة و اعتماد توصيف المقرر من مجلس القسم بتاريخ



**COURSE
SPECIFICATIONS**

Biochemistry -1

**Third year – firstTerm
2018-2019**

Course Specification of Biochemistry (1)

University: **Zagazig** Faculty: **Pharmacy**

A- Course specifications:

Program(s) on which the course is given: Bachelor of pharmacy
Major or Minor element of programs: Major
Department offering the program: -----
Department offering the course: Biochemistry department
Academic year/Level: 2018-2019 Third year/First term
Date of specification approval:

B- Basic information:

Title: Biochemistry (1) Code: BC 310
Credit Hours: ---
Lectures : 2 hrs/week
Practical: 2 hr/week
Tutorials: ---
Total: 3 hrs/week

C- Professional information:

1-Overall Aims of the Course:

On completion of the course, students will be able to illustrate chemistry and functions of carbohydrate, proteins and Enzymes as well as the principles of bioenergetics, oxidative phosphorylation and porphyrin pathways. Also students will be able to Perform laboratory tests for biological samples and to interpret of laboratory results for diagnosis of diseases.

2-Intended Learning Outcomes of Biochemistry (1) (ILOs):

A- Knowledge and Understanding	
a1	Explain the principles of electron transport chain and oxidative phosphorylation.
a2	Outline classification of enzymes and their mode of action.
a3	Illustrate chemistry and functions of carbohydrates, lipids, proteins and nucleic acid including DNA.
a4	Summarize importance of carbohydrates, proteins and lipids and their role in maintaining body functions.
a5	Identify synthesis and degradation of hemoglobin and the associated disorders
a6	Describe the laboratory diagnosis of porphyrin disorders.
B- Professional and Practical skills	
b1	Handle basic laboratory equipments and chemicals effectively and safely.
b2	Perform Qualitative tests to identify different types of proteins and lipids.
b3	Perform laboratory tests for biological samples to detect the presence of different parameters associated with diseases.
C- Intellectual skills	
c1	Select the appropriate method for differentiation between different classes of carbohydrates and fatty acids.
c2	Assess different methods used for determination of heme disorders.
c3	Analyze and interpret quantitative data of laboratory results in a suitable form.
c4	Compare between different classes of enzymes.
D- General and Transferable skills	
d1	Work effectively as a member of a team.
d2	Manage time to achieve targets within deadlines.
d3	Write and present reports.
d4	Develop self-learning skills.

D-contents:

Week No.	Lecture contents (2 hrs/lec.)	Practical session (2hrs/lab)
1	<ul style="list-style-type: none"> - Biological oxidation. - Substrate level phosphorylation - Oxidative phosphorylation. 	<ul style="list-style-type: none"> - Laboratory Safety - Measures
2	<ul style="list-style-type: none"> - Electron transport chain - Uncouplers - Energy gain from glucose oxidation in cells . 	<ul style="list-style-type: none"> - Introduction about practical biochemistry.
3	<ul style="list-style-type: none"> - Enzymes structure - Properties of enzymes - Enzymes: mechanism of actions and coenzymes 	<ul style="list-style-type: none"> - Separation of serum and plasma.
4	<ul style="list-style-type: none"> - Factors affecting reaction velocity - Inhibition of enzyme activity - Regulation of enzyme activity 	<ul style="list-style-type: none"> - Activity-1 (Drugs containing Carbohydrates)
5	<ul style="list-style-type: none"> - Correlation of enzymes with diseases 	<ul style="list-style-type: none"> - Activity-2 (Drugs containing proteins)
6	<ul style="list-style-type: none"> - Chemistry of heme - Regulation of heme metabolism and metabolic disorders. 	<ul style="list-style-type: none"> Diabetes.
7	<ul style="list-style-type: none"> - Midterm exam 	<ul style="list-style-type: none"> - Midterm exam
8	<ul style="list-style-type: none"> - Structure and classification of amino acids - Acidic and basic properties of amino acids 	<ul style="list-style-type: none"> Qualitative tests for proteins

	- Structure of proteins - Functions of proteins - Plasma proteins	
9	-Definition and function of lipids - Classification of lipids Distribution of lipids in the body - Types of fatty acids and essential fatty acids.	Qualitative tests for lipids .
10	Definition and functions of carbohydrates.	-Quantitative determination of serum glucose
11	Classification of carbohydrates (monosaccharaides ,disaccharides, oligosaccharides examples with structure) .	Practical exam 1
12	Polysaccharides: examples and classification - Physical and chemical properties of carbohydrates .	Practical exam 2
13	Chemistry of nucleic acid including nucleic acid.	
14	Revision and Open discussion	
15	Final exam	

E- Teaching and Learning Methods:

- Lectures
- Practical sessions
- Self-learning (Students are asked to collect some marketed products containing carbohydrates or proteins and prepare a report& presentation about the product (Name, composition, uses and role of it).

F-Student Assessment Methods:

- 1- Written and Midterm exam to assess a1, a2, a3, a4, a5, a6, c2, c4
- 2- Activity to assess d1, d2, d3, d4
- 3- Practical exam to assess b1, b2, b3, c1, c3, d2, d4
- 4- Oral exam to assess a1, a2, a3, a4, a5, a6, c2, c4, d4

Assessment schedule:

Assessment(1): Midterm exam	Week 7
Assessment (2): Written exam	Week 15
Assessment (3): Activity	Week 4,5
Assessment (4): Practical exams	Week 11,12
Assessment (5): Oral exam	Week 15

Weighting of Assessment:

Assessment method	Marks	Percentage
Midterm exam	10	10%
Written exam	50	50%
Practical exam	20	20%
Activity	5	5%
Oral exam	15	15%
TOTAL	100	100%

G- Facilities Required for Teaching and Learning:

- Black (white) board, Data show, Laboratory equipment (spectrophotometer, centrifuge) and Chemicals.

H- List of References:

1- Course Notes: Student book of Biochemistry (1) approved by biochemistry department (2018).

- Practical notes of Biochemistry (1) approved by biochemistry department (2018).

2- Essential books:

- i- Marks' basic medical biochemistry: a clinical approach (third edition); Lieberman M., Marks A.D., Smith C.M. (2008).
- ii- Lehninger principles of biochemistry (seventh edition); Nelson D.L., Cox M.M., Freeman W.H. (2017).

3- Recommended books:

- i- Biochemistry ; illustrated reviews (seventh edition); Garrett R.H. and Grisham C.M.; Thomson learning, Inc (2017).
- ii- Harper's Illustrated Biochemistry (31th edition); Murray R.K., Bender D.A., Botham K.M., Kennelly P.J., Rodwell V.W., Weil P.A.; The Mc Graw Hill companies Inc. (2018).

4- Periodicals and websites:

Egyptian J. of biochem. and molecular biology.
Egyptian J. of Pharmaceutical sciences.

Arab J. of Laboratory Medicine,

J. of Cardiovascular diseases.

www.Pubmed.Com

www.sciencedirect.com.

Course coordinators: Prof. Dr. Hoda Elsayed

Head of department: Prof. Dr. Sahar Elsweify

Matrix I of Biochemistry 1 course 2018-2019

Course Contents		ILOs of Biochemistry 1 course																
		Knowledge and understanding						Professional and practical skills			Intellectual skills				General and transferable skills			
Lectures		a1	a2	a3	a4	a5	a6	b1	b2	b3	c1	C2	C3	C4	d1	d2	d3	d4
1	- Biological oxidation. - Substrate level phosphorylation - Oxidative phosphorylation	x	x															
2	- Electron transport chain -Uncouplers - Energy gain from glucose oxidation in cells .	x																
3	Mechanism of action of enzymes- coenzymes- factors affecting reaction velocity		x															
4	Inhibition of enzyme activity and regulation		x															
5	Correlation of enzymes with disease- Functions and classification of carbohydrates		x	x	x													
6	Classification of polysaccharides- physical and chemical properties of carbohydrates			x										x				
7	Structure and classification of amino acids - acidic and basic properties of amino acids			x														
8	Structure of proteins			x														
9	Functions of proteins- plasma proteins- functions and classification of lipids			x	x													
10	Distribution of lipids in the body- types of fatty acids			x	x													
11	Chemistry of porphyrins					x												
12	Metabolism of porphyrins and related diseases.					x	x					x						
13	Revision- open discussion																	x
Practical sessions																		
14	Laboratory safety measures							x										
15	Introduction about biochemistry																	

16	Separation of serum and plasma									X		X							
17	Qualitative tests for lipids										X	X							
18	Qualitative tests for proteins .										X	X							
19	Quantitative determination of serum glucose.										X	X		X					
20	Activity															X	X	X	X

Matrix II of Biochemistry 1 course 2018-2019

National Academic Reference Standards (NARS)		Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods			Method of assessment		
						Lecture	Practical session	Self learning	Written exam	Practical exam	Oral exam
2.1	Principles of basic, pharmaceutical, medical, social, behavioral, management, health and environmental sciences as well as pharmacy practice.	A4	a1	- Electron transport chain -Uncouplers - Energy gain from glucose oxidation in cells .	Student book	x			x		x
				Oxidative phosphorylation	Student book Essential books	x			x		x
			a2	Enzyme structure-enzyme properties	Student book	x			x		x
				Mechanism of action of enzymes-coenzymes-factors affecting reaction velocity	Student book Essential books Internet	x		x	x		x
				Inhibition of enzyme activity and regulation	Student book Essential books	x			x		x
				Correlation of enzymes with disease	Student book Essential books	x			x		x
			a3	Classification of carbohydrates	Student book	x			x		x
				Classification of polysaccharides-physical and chemical properties of carbohydrates	Student book	x			x		x

				Structure and classification of amino acids - acidic and basic properties of amino acids	Student book	x			x		x
				Structure of proteins	Student book	x			x		x
				Types of fatty acids	Student book	x			x		x
				Classification of lipids	Student book	x			x		x
			a4	Correlation of enzymes with disease	Student book Essential books	x			x		x
				Functions of proteins and plasma proteins	Student book	x			x		x
				Distribution of lipids in the body	Student book	x			x		x
2.11	Principles of body function in health and disease states as well as basis of genomic and different biochemical pathways regarding their correlation with different diseases.	A 25	a5	Chemistry of porphyrins	Student book	x			x		x
				Metabolism of porphyrins and related diseases.	Student book Essential books	x			x		x
3.2	Handle and dispose chemicals and pharmaceutical preparations safely	B2	b1	Laboratory safety measures	Practical notes		x			x	

3.6	Monitor and control microbial growth and carry out laboratory tests for identification of infectious and non-infectious diseases.	B10	b2	Qualitative tests for proteins	Practical notes		x				x		
				Qualitative tests for lipids	Practical notes		x				x		
		B11	b3	Quantitative determination of blood glucose	Practical notes		x					x	
4.3	Apply qualitative and quantitative analytical and biological methods for QC and assay of raw materials as well as pharmaceutical preparations	C6	c1 c2	Metabolism of porphyrins and related diseases.	Student book	x					x		
4.13	Analyze and interpret experimental results as well as published literature	C18	c 3	Separation of plasma and serum	Practical notes							x	
				Quantitative determination of blood glucose			x						
		c 4	Classification of polysaccharides-physical and chemical properties of carbohydrates	Student book	x					x			x

5.3	Work effectively in a team	D3	d1	Activity	Internet Recommended books		x	x		x	
5.5	Practice independent learning needed for continuous professional development	D6	d4	Activity	Internet Recommended books		x	x		x	
5.8	Demonstrate creativity and time management abilities	D9	d2	Activity	Internet Recommended books			x		x	
5.9	Implement writing and presentation skills	D10	d3	Activity	Internet Recommended books			x		x	
				Revision- Open discussion	Student book Internet Recommended books	x		x			x
				Activity	Internet Recommended books		x	x		x	



**COURSE
SPECIFICATIONS**

Medicinal Chemistry-1

**Third year – first Term
2018-2019**

Course specification of Medicinal Chemistry-1

University: Zagazig

Faculty: Pharmacy

A- Course specifications:

Program (s) on which the course is given: Bachelor of Pharmacy

Major or Minor element of programs: Major

Department offering the program: -----

Department offering the course: Medicinal chemistry department

Academic year Level: Third year/Second semester

Date of specification approval: September 2018

B- Basic information:

Title: Medicinal Chemistry-1

Code: MC310

Credit Hours: ---

Lectures: 2hrs/week

Practical: 2hrs/week

Tutorials: ---

Total: 3hrs/week

C- Professional information:

1-Overall aim of the course

On completion of the course, the student will be able to demonstrate physicochemical properties of drugs in relation to biological action, total synthesis, mechanism of action, and adverse reactions, and explain basics of medicinal chemistry through identification of the chemistry and uses of different drug classes (Antibiotics, antiseptics, disinfectants, antiprotozoals, antimalarials, anthelminitics, antifungals, and sulfonamides).

2- Intended Learning Outcomes:

A- Knowledge and Understanding:	
a1	Describe the chemistry of different drug classes (Antibiotics, antiseptics, disinfectants, antiprotozoals, antimalarials, anthelminitics, antifungals&sulfonamides).
a2	Outline synthetic pathways of some of the aforementioned drugs.
a3	Recognize mode of action & SAR of the aforementioned drugs.
B- Professional and Practical skills:	
b1	Handle basic laboratory equipments and chemicals effectively and safely.
b2	Demonstrate the impurities of active substances in samples.
b3	Perform a research study for assay and analysis of impurities and compare results with the pharmacopeia.
C- Intellectual skills:	
c1	Develop GLP guide lines in pharmacy practice through learning different analytical techniques.
c2	Select quantitative and qualitative methodology of authentic samples.
c3	Predict quantitative and qualitative methodology of pharmaceutical preparations.
D-General and Transferable skills:	
d1	Work effectively as a member of a team with other students.
d2	Write reports and present it.
d3	Develop problem solving and decisions making skills.

D- Contents:

Week No.	Lecture contents (2 hrs/lec.)	Practical session (2hrs/lab)
1	Introduction to medicinal chemistry (physicochemical properties in relation to biological action).	Laboratory safety measures.
2	Antiprotozoal agents (antiamoebic, antitrichomonal, anti giardial agents, antileishmanial & antitrypanosomal agents).	Limit test for chloride (E.p. & B.p.).
3	Antimalarials (4-amino quinolines, 8-aminoquinolines, acridine derivatives, biguanides & pyrimidine derivatives).	Limit test for sulphate (E.P).
4	Anthelminitics (drugs active for nematodes & cestodes).	Limit test for sulphate (B.P).
5	Anthelminitics (drugs active for trematodes & antibelharzials).	Limit test for iron (E.P.) Activity 1 (case study).
6	Sulphonamides.	Limit test for lead (E.P).
7	Midterm exam	
8	Antifungals.	Limit test for lead (B.P).
9	Antibiotics (B-lactam penicillin antibiotics).	Test for heavy metals (E.p.). Activity 2 (case study).
10	Antibiotics (B-lactam antibiotics, cephalosporins & aminoglycosides).	Test for purity
11	Antibiotics (macrolide, fused ring, conjugated polyene compounds & poly peptide antibiotics).	Revision scheme 1.
12	Antibiotics (sulphur containing antibiotics & unclassified antibiotics).	Revision scheme 2.
13	Antiseptics& disinfectants (alcohol, aldehyde, acids, oxidizing agents, chlorine containing compounds, phenolic compounds, cationic surfactants).	Practical exam.
14	Antiseptics& disinfectants (dyes, nitrofurans derivatives, mercury containing compounds & floroquinolones).	Practical exam.
15	Final written exam	

E. Teaching and learning methods:

- Lectures.
- Practical sessions.
- Activity (case study).
- Self learning.

F. Student assessment methods:

- Written exams to assess: a1, a2, a3, c1, c2,c3.
- Practical exams to assess: b1, b2, b3, c2.
- Oral exams to assess: a1, a2, a3, c1, c2, c3.
- Written reports to assess: d1, d2, d3.

Assessment schedule:

Assessment (1): Midterm exam	Week 7
Assessment (2): Final written exam	Week 15
Assessment (3): Written reports	Week 5,9
Assessment (4): Practical exam	Week 13, 14
Assessment (5): Oral exam	Week 15

Weighting of Assessment:

Assessment method	Marks	Percentage
Midterm exam	10	10%
Final written exam	50	50%
Written reports	5	5%
Practical exam	20	20%
Oral exam	15	15%
TOTAL	100	100%

G. Facilities required for teaching and learning:

- Black (white) board.
- Data show Presentation.
- Explanatory videos.
- Laboratory equipment (Nessler tubes, test tubes, pipettes, pipette filler, holders).
- Chemicals.

G- List of References:

1- Course notes:

- Student book of Medicinal Chemistry-1.

2- Essential Books:

- An Introduction to Medicinal Chemistry, Graham L. Patrick, sixth edition, Oxford University Press (2017).
- Foye's Principles of Medicinal Chemistry, W.O. Foye, T. L. Lemke, David A Williams, seventh edition, Wolters Kluwer Health, United States (2012).

3- Recommended books:

- **Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry, John Beale, John Block, 12th edition, Wolters Kluwer Health (2010).**
- **Burger's Medicinal Chemistry, Drug Discovery, and Development, Donald J. Abraham, David P. Rotella, 7th Edition, Wiley (2010).**

4- Periodicals and websites:

- <http://www.ncbi.nlm.nih.gov/sites/entrez>
- <https://www.ekb.eg/web> ((Egyptian knowledge bank (EKB))
- <http://www.pharmacopoeia.co.uk/>
- www.Pubmed.Com
- www.sciencedirect.com

Course Coordinator: Prof. Dr./ Sobhy Mohamed El-Adl.

Head of Department: Prof. Dr./ Kamel A. Metwally.

Date: 2018/9/24 تم مناقشة و اعتماد توصيف المقرر من مجلس القسم بتاريخ

Matrix I of Medicinal chemistry-1 course

Course Contents		ILOs of Medicinal chemistry-1course											
		Knowledge and understanding			Professional and practical skills			Intellectual skills			General and transferable skills		
Lectures		a1	a2	a3	b1	b2	b3	c1	c2	c3	d1	d2	d3
1	Antiseptics and disinfectants (alcohols, aldehydes, acids, oxidizing agents).	x	x	x				x					
2	Antiseptics and disinfectants (chlorine containing compounds, phenolic compounds, cationic surfactants, dyes, nitrofurans derivatives).	x	x	x				x	x	x			
3	Antiseptics and disinfectants (floroquinolones).	x	x	x				x	x	x			
4	Sulphonamides.	x	x	x				x	x	x			
5	Antifungal agents.	x	x	x				x	x	x			
6	Antibiotics (cell wall synthesis inhibitors).	x	x	x				x	x	x			
7	Periodical exam.												
8	Antibiotics (cell wall synthesis inhibitors).	x	x	x				x	x	x			

9	Antibiotics (cell wall synthesis inhibitors and cell membrane disruptors).	x	x	x				x	x	x			
10	Antibiotics (protein synthesis inhibitors and nucleic acid synthesis inhibitors).	x	x	x				x	x	x			
11	Antiprotozoal agents (antiamoebic, antitrichomonal, anti-giardial agents, antileishmanial and antitrypanosomal agents).	x	x	x				x					
12	Antimalarials (4-amino quinolines, 8-aminoquinolines, acridine derivatives, biguanides and pyrimidine derivatives).	x	x	x				x					
13	Anthelminitics (drugs active for nematodes and cestodes).	x	x	x				x					
14	Anthelminitics (drugs active for trematodes and antibelharzials).	x	x	x				x					
15	Revision							x	x	x			
Practical sessions													
1	Laboratory safety measures.				x								
2	Limit tests for chlorides, sulphate, iron, and lead.					x	x						
3	Test for heavy metals, Test for purity.					x	x						
4	Activity (case study).							x	x	x	x	x	x

Matrix II of Medicinal chemistry 1 course

National Academic Reference Standards (NARS)		Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods			Methods of assessment		
						Lecture	Practical session	Case study	Written exam	Practical exam	Oral exam
2.1	Principles of basic, pharmaceutical, medical, social, behavioral, management, health and environmental sciences as well as pharmacy practice.	A2	a1	Antibiotics (B-lactam antibiotics penicillins)	Student book	X			x		x
				Antibiotics (B-lactam antibiotics cephalosporins) & aminoglycosides	Student book	X			x		x
				Antibiotics (macrolide , fused ring , conjugated polyene compounds , poly peptide antibiotics)	Student book	X			x		x
				Antibiotics (sulphur containing antibiotics , unclassified antibiotics). Antiseptics&disinfectants (alcohol,aldehyde,acids)	Student book Essential books Internet	X		x	x		x
				Antiseptics & disinfectants (chlorine containing compounds, phenolic compounds, cationic surfactants, dyes, nitrofurans	Student book	X			x		x

			derivatives)								
			Antiseptics & disinfectants (floroquinolones)	Student book	X			x		x	
			Antiprotozoal agents (antiamoebic , antitrichomonal , anti giardial agents , antileishmanial ,antitrypanosomal agents)	Student book	x			x		x	
			Antimalarials (4-amino quinolines 8-aminoquinolines)	Student book	x			x		x	
			Antimalarials (acridine derivatives , Biguanides , pyrimidine derivatives)	Student book	x			x		x	
			Anthelminitics (drugs active for nematodes &cestodes)	Student book	x			x		x	
			Anthelminitics (drugs active for trematodes antibelharzial) &. Antifungals	Student book, essential books	x		x	x		x	
			Antifugals & sulfonamides classification	Student book	x			x		x	
			sulfonamides	Student book	x			x		x	
			2.5	Principles of drug design, development and synthesis.	A15	a2	Antibiotics (B-lactam antibiotics penicillins)	Student book	x		
Antibiotics (B-lactam antibiotics cephalosporins) & aminoglycosides	Student book	x							x		x

Antibiotics (macrolide , fused ring , conjugated polyene compounds , poly peptide antibiotics)	Student book Essential books Internet	x			x	x		x
Antibiotics (sulphur containing antibiotics , unclassified antibiotics). Antiseptics&disinfectants (alcohol,aldehyde,acids)	Student book	x				x		x
Antiseptics & disinfectants (chlorine containing compounds, phenolic compounds, cationic surfactants, dyes, nitrofurans derivatives)	Student book	x				x		x
Antiseptics & disinfectants (floroquinolones)	Student book	x				x		x
Antiprotozoal agents (antiamoebic , antitrichomonal , anti giardial agents , antileshmanial ,antitrypanosomal agents)	Student book	x				x		x
Antimalarials (4-amino quinolines 8-aminoquinolines)	Student book	x				x		x
Antimalarials (acridine derivatives , Biguanides , pyrimidine derivatives)	Student book	x				x		x
Anthelminitics (drugs active for nematodes &cestodes)	Student book	x			x	x		x

2.13	Pharmacological properties of drugs including mechanisms of action, therapeutic uses, dosage, contra-indications, ADRs and drug interactions.	A30	a3	Anthelminitics (drugs active for trematodes antibelharzial) &. Antifungals	Student book	x			x		x	
				Antifugals & sulfonamides classification	Student book	x			x		x	
				sulphonamides	Student book	x			x		x	
				Antibiotics (B-lactam antibiotics penicillins)	Student book	x			x		x	
				Antibiotics (B-lactam antibiotics cephalosporins) & aminoglycosides	Student book	x			x		x	
				Antibiotics (macrolide , fused ring , conjugated polyene compounds , poly peptide antibiotics)	Student book	x			x		x	
				Antibiotics (sulphur containing antibiotics , unclassified antibiotics). Antiseptics&disinfectants (alcohol,aldehyde,acids)	Student book, Internet	x		x		x		x
				Antiseptics & disinfectants (chlorine containing compounds, phenolic compounds, cationic surfactants, dyes, nitrofurans derivatives)	Student book	x				x		x
				Antiseptics & disinfectants (floroquinolones)	Student book	x				x		x

				Antiprotozoal agents (antiamoebic , antitrichomonal , anti giardial agents , antileishmanial , antitrypanosomal agents)	Student book	x			x		x
				Antimalarials (4-amino quinolines 8-aminoquinolines)	Student book	x			x		x
				Antimalarials (acridine derivatives , Biguanides , pyrimidine derivatives)	Student book	x			x		x
				Anthelminitics (drugs active for nematodes & cestodes)	Student book	x			x		x
				Anthelminitics (drugs active for trematodes antibelharzial) &. Antifungals	student book Internet	x		x	x		x
				Antifugals & sulfonamides	Student book	x			x		x
				sulphonamides	Student book	x			x		x
3.2	Handle and dispose chemicals and pharmaceutical preparations safely	B2	b1	Laboratory safety measures	Practical notes			x			x
3.4	Extract, isolate, synthesize, purify, identify, and/or	B6	b2	Limit tests for chlorides , sulphates , iron , lead	Practical notes			x			x

	standardize active substances from different origins.			Test for heavy metals	Practical notes		x			x	
3.11	Conduct research studies and analyze the results.	B19	b3	Limit tests for chlorides , sulphates , iron , lead	Practical notes		x	x		x	
				Test for heavy metals	Practical notes		x	x		x	
4.2	Comprehend and apply GLP, GPMP, GSP and GCP guidelines in pharmacy practice.	C3	c1	Limit tests for chlorides , sulphates , iron , lead	Practical notes		x			x	
				Test for heavy metals	Practical notes		x			x	

4.3	Apply qualitative and quantitative analytical and biological methods for QC and assay of raw materials as well as pharmaceutical preparations	C6	c2	Limit tests for chlorides , sulphates , iron , lead	Practical notes		x			x	
				Test for heavy metals	Practical notes		x			x	
4.3	Apply qualitative and quantitative analytical and biological methods for QC and assay of raw materials as well as pharmaceutical preparations	C7	c3	Antiseptics & disinfectants (chlorine containing compounds, phenolic compounds, cationic surfactants, dyes, nitrofurans derivatives) Antiseptics & disinfectants (floroquinolones) Antifugals & sulfonamides Limit tests for chlorides , sulphates , iron , lead in Pharmaceutical product	Student book Practical notes	x			x		x
5.3	Work effectively in a team	D3	d1	Limit tests for chlorides , sulphates , iron , lead	Practical notes		x			x	

				Activity	Internet Recommended books		x	x		x	
5.9	Implement writing and presentation skills	D10	d2	Limit tests for chlorides , sulphates , iron , lead	practical notes		x			x	
				Test for heavy metals	Practical notes		x			x	
5.10	Implement writing, thinking, problem solving and decision making abilities	D11	d3	Activity	Internet Recommended books		x	x		x	
				Limit tests for chlorides , sulphates , iron , lead	practical notes		x			x	
				Activity	Internet Recommended books		x	x		x	



**COURSE
SPECIFICATIONS
Pharmaceutical
Microbiology
Third year – first Term
2018-2019**

Course Specification of Pharmaceutical Microbiology

University: Zagazig **Faculty:** Pharmacy

A- Course specifications:

Programme(s) on which the course is given: Bachelor of Pharmacy.

Major or Minor element of programmes: Major

Department offering the program: -----

Department offering the course: Microbiology and Immunology.

Academic year/ level: Third year/ First term

Date of specification approval: 2018-2019

B- Basic information:

Title: Pharmaceutical Microbiology Code: MI 311

Credit Hours: ---

Lectures: 2 hrs/week

Practical: 2 hrs/week

Total: 3 hrs/week

C- Professional information:

1-Overall Aims of the Course:

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

- Demonstrate the different types of antimicrobial agents, the sources and control of microbial contamination of the pharmaceutical products and outline the concepts and applications of microbial biotechnology. Use tests for standardization of different antimicrobial agents. Suggest the suitable antimicrobial agent for each infection and the appropriate preservative for formulation of pharmaceutical preparations. Interact effectively with public and team working.

2-Intended Learning Outcomes of Pharmaceutical Microbiology (ILOs):

Knowledge and Understanding	
a1	Outline different types of antimicrobial agents and their mechanism of action
a2	Describe the properties and functions of preservative in pharmaceutical preparations
a3	Outline the basic concepts of sterilization, its different methods and its applications
a4	Outline the principles of sterility testing and sterility assurance
a5	Illustrate the concepts of microbiological quality control of pharmaceutical products and evaluation of preservatives
Professional and Practical skills	
b1	Use the proper terms of microbiology
b2	Handle basic biohazards and chemicals effectively and safely.
b3	Advise health care professionals and patients for rational use of drugs and problems of misuse of antimicrobial agents
Intellectual skills	
c1	Select the appropriate preservative for effective formulation of pharmaceutical preparations
c2	Apply GMP guidelines in preparation of pharmaceutical products
c3	Select the most suitable antimicrobial agent for each infection
General and Transferable skills	
d1	Communicate efficiently in verbal and written way.
d2	Acquire online search skills through writing reports and presenting them
d3	Develop critical thinking and decision-making for interpretation of experimental results

D- Contents:

Week No.	Lecture (2hrs/week)	Practical session (2hrs/week)
1	<ul style="list-style-type: none"> - Introduction - Definition and terminology - Antibiotic and chemotherapeutic agents - Mechanisms of action of antimicrobial agents 	<ul style="list-style-type: none"> - Laboratory safety measures - Bacterial counts: total count, viable count - Sterility testing
2	Classification of antimicrobial agents: <ol style="list-style-type: none"> 1. Drugs acting on cell wall 2. Drugs acting on cell membrane 3. Drugs inhibiting protein Synthesis 4. Drugs inhibiting nucleic acid Synthesis 5. Antimetabolites 	<ul style="list-style-type: none"> - Antibiotic susceptibility testing: Kirby-Bauer method
3	<ul style="list-style-type: none"> - Antituberculous drugs - Antileprosy agents - Antifungal drugs - Antiprotozoal drugs - Antiviral drugs - Microbial resistance to antimicrobial agents - Microbial assay of Antibiotics and vitamins 	<ul style="list-style-type: none"> - Demonstration of spectrum of action by strip-plate method - Demonstration of interaction between two antimicrobial agents
4	<ul style="list-style-type: none"> - Disinfection and antisepsis - Chemical agents used as disinfectant and antiseptic 	<ul style="list-style-type: none"> - Determination of Minimum inhibitory concentration (MIC) by broth dilution method
5	<ul style="list-style-type: none"> - Factors affecting the activity of disinfectant and antiseptic - Evaluation of disinfectant and antiseptic 	<ul style="list-style-type: none"> - Determination of MIC by Agar diffusion method - Activity
6	<ul style="list-style-type: none"> - Sources of microbial contamination and spoilage of pharmaceutical products and factors affecting the 	<ul style="list-style-type: none"> - Antibiotic assay
- 7	- Midterm exam.	
8	<ul style="list-style-type: none"> - Control of microbial spoilage - Good Manufacture Practice - Preservation of pharmaceutical products and preservatives commonly used - Factors affecting preservative activity 	<ul style="list-style-type: none"> - Determination of temperature coefficient

	<ul style="list-style-type: none"> - Evaluation of preservative's efficacy - Microbial biotechnology and fermentation 	
9	<ul style="list-style-type: none"> • Preservation of pharmaceutical products and preservatives commonly used • Factors affecting preservative activity <p>Evaluation of preservative's efficacy</p>	- Determination of concentration exponent
10	<ul style="list-style-type: none"> • Control of microorganisms by sterilization and survival curve 	<ul style="list-style-type: none"> - Preparation of heat killed vaccine - Activity
11	<ul style="list-style-type: none"> • sterilization parameters and sterility assurance 	- Determination of phenol-coefficient: Rideal-Walker & Chick-Martin methods
12	<ul style="list-style-type: none"> • Methods of sterilization and sterilizers 	Practical exam
13	<ul style="list-style-type: none"> • Applications of sterilization • Sterilization of pharmaceutical products 	Practical exam.
14	<ul style="list-style-type: none"> • Sterilization control and sterility testing 	
15	- Final exam	

E- Teaching and Learning Methods:

- Lectures
- Practical sessions
- Self learning- Activity: Report writing about most appropriate methods for sterilization of different pharmaceutical products.

F- Student Assessment Methods:

- 1- **Written exam to assess** a1, a2, a3, a4, a5, c1, c2, c3
- 2- **Activity to assess** d2,d3
- 3- **Practical exam to assess** b1, b2, b3, c3, d1
- 4- **Oral exam to assess** a1, a2, a3, a4, a5, c1, c2, c3, d1

Assessment schedule:

Assessment (1): midterm exam	Week 7
Assessment (2): Final Written exam	Week 15
Assessment (3): Activity	Week 5,10
Assessment (4): Practical exam	Week 12, 13
Assessment (5): Oral exam	Week 15

Weighting of Assessment:

Assessment method	Marks	Percentage
Written exam	50	50%
Activity	5	5%
Midterm exam	10	10 %
Practical exam	20	20%
Oral exam	15	15%
TOTAL	100	100%

G- Facilities Required for Teaching and Learning:

- Black (white) board, Data show, Laboratory equipment (microscope, autoclave) and Chemicals.

H- List of References:

- 1- Student book of Pharmaceutical Microbiology, part II approved by microbiology department (2018).
- Practical notes of Pharmaceutical Microbiology, part II approved by microbiology department (2018).

2- Essential Books (Text Books):

- i- Pharmaceutical Microbiology (sixth edition); Hugo W.B. and Russell A.D; Blackwell Scientific Editions; London (1998).
- ii- Hospital hygiene (third edition); Maurer I.M.; Edward Arnold London (1985)
- iii- Medical microbiology (4th edition); Murray P.R.; Mosby London (2001)
- iv- Sterile dosage forms (fourth edition); Turco S. and King R.E.; Philadelphia : Lea &Febiger (1994).

3- Recommended Books:

i- Sterilization, Disinfection and Preservation (fourth edition); Ed Block SS, Lippincott Williams & Wilkins, London (2001).

ii- Antibiotics in Laboratory Medicine (fourth edition); Ed Lorian V, Williams and Wilkins, Baltimore (1996).

iii- Molecular Biotechnology; Pasternak G., ASM press, WashingtonDC (1994).

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Periodicals

and websites:

Egyptian J. of Microbiology.

Egyptian J. of Pharmaceutical sciences.

www.Pubmed.Com

www.sciencedirect.com.

Course Coordinator: Prof. Dr/ Fathy Serry

Head of Department: Prof. Dr/ Nehal Elsayed Youssef

Date: تم مناقشة و اعتماد توصيف المقرر من مجلس القسم بتاريخ 2018/ 9 / 30

Matrix I of Pharmaceutical Microbiology Course

Course Contents 1. Lectures		ILOs of Pharmaceutical Microbiology course													
		Knowledge & understanding					Professional and practical skills			Intellectual skills			General and transferable skills		
		a1	a2	a3	a4	a5	b1	b2	b3	c1	c2	c3	d1	d2	d3
1	Introduction Definition and terminology Antibiotic and chemotherapeutic agents Mechanisms of action of antimicrobial agents	X											x		
2	Classification of antimicrobial agents: Drugs acting on cell wall Drugs acting on cell membrane	X										X	x		
3	Drugs inhibiting protein synthesis Drugs inhibiting nucleic acid synthesis Antimetabolites	X										X	x		
4	Antituberculous drugs, Antileprosy agents Antifungal drugs Antiprotozoal drugs Antiviral drugs Microbial resistance to antimicrobial agents Microbial assay of Antibiotics and vitamins	X										X		x	
5	• Disinfection and antiseptics chemical agents used as disinfectant and antiseptic	X										X		x	
6	• Factors affecting the activity of disinfectant and antiseptic • Evaluation of disinfectant and antiseptic	X												x	
7	• Sources of microbial contamination and spoilage of pharmaceutical products and factors affecting them		X											x	

8	Control of microbial spoilage Good Manufacture Practice Preservation of pharmaceutical products and preservatives commonly used Factors affecting preservative activity Evaluation of preservative's efficacy		X			X	x					x	X		x		
9	Control of microorganisms by sterilization and survival curve			X											x		
10	sterilization parameters and sterility assurance			X		X									x		
11	Methods of sterilization and sterilizers			X											x		
12	Applications of sterilization			X											x		
13	Sterilization of pharmaceutical products			X		X									x		
14	Sterilization control and sterility testing			X	X	X									x		
Practical sessions																	
1	Laboratory safety measures Bacterial counts & Sterility testing							x	x						x	x	x
2	Antibiotic susceptibility testing: Kirby-Bauer method								x	x					x	x	x
3	Demonstration of spectrum of action by strip-plate method Demonstration of interaction between two antimicrobial agents								x	x					x	x	x
4	Determination of Minimum inhibitory concentration (MIC) by broth dilution								x	x					x	x	x
5	Determination of MIC. by Agar diffusion method								x	x					x	x	x
6	Antibiotic assay								x	x					x	x	x
7	Determination of temperature coefficient								x						x		x
8	Determination of concentration exponent								x						x		x
9	Preparation of heat killed vaccine							x							x		x

10	Determination of phenol-coefficient: Rideal-Walker method							x	x	x			x	x	x
11	Determination of phenol-coefficient: Chick-Martin method							x	x	x			x	x	x
	Activity (report)												x	x	x

Matrix II of Pharmaceutical Microbiology Course

National Academic Reference Standards (NARS)	Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods			Method of assessment				
					Lecture	Practical session	Self learning	Midterm exam	Practical exam	Oral exam	Written exam	
2.1	Principles of basic, pharmaceutical, medical, social, behavioral, management, health and environmental sciences as well as pharmacy practice	A2 Mention principles of pharmaceutical sciences (Pharmacy orientation; medical terminology; physical pharmacy; pharmaceutics; industrial pharmacy; pharmaceutical technology; biopharmaceutics; pharmacokinetics; pharmaceutical chemistry; pharmacognosy; pharmaceutical microbiology; molecular biology and pharmaceutical biotechnology; quality assurance and quality control; instrumental analysis and biological drug assays).	a1-a2	Introduction Definition and terminology Antibiotic and chemotherapeutic agents Mechanisms of action of antimicrobial agents	Student book, Essential books	X			X		X	X
			Classification of antimicrobial agents: Antibiotics, Antituberculous, Antileprosy agents, Antifungal, Antiprotozoal & Antiviral drugs									
			Microbial resistance to antimicrobial agents Microbial assay of Antibiotics and vitamins									
			Disinfection and antisepsis Chemical agents used as disinfectant and antiseptic									

2.7	Principles of various instruments and techniques including sampling, manufacturing, packaging, labeling, storing and distribution processes in pharmaceutical industry	<p>A18 Mention various instruments and techniques for GMP and quality assurance of sampling, manufacturing, packaging, labeling, storing and distribution processes in pharmaceutical industry</p>	a3, a4, a5	<p>Control of microbial spoilage Good Manufacture Practice Preservation of pharmaceutical products and preservatives commonly used Factors affecting preservative activity Evaluation of preservative's efficacy</p>	Student book, Essential books	x			x		X	
2.10	Principles of public health issues including sources and control of microbial contamination as well as sanitation, disinfection, sterilization methods and microbiological QC of pharmaceutical products		<p>A22 Identify sources and control of microbial contamination</p> <p>A23 List the different methods of sterilization, sterility testing and their application in microbiological quality control of pharmaceutical products</p>	a3, a4, a5	<p>Control of microorganisms by sterilization and survival curve sterilization parameters and sterility assurance Methods of sterilization and sterilizers Applications of sterilization Sterilization of pharmaceutical products Sterilization control and sterility testing</p>	Student book, Essential books	X					X
				<p>Applications of sterilization Sterilization of pharmaceutical products Sterilization control and sterility testing</p>	Student book, Essential books	x			x		X	

3.1	Use the proper pharmaceutical and medical terms, abbreviations and symbols in pharmacy practice	B1 Use the proper pharmaceutical and medical terms and abbreviations and symbols in pharmacy practice	b1	All practical sessions	Practical notes		x			x		
							x			x		
							x			x		
							x			x		
3.2	Handle and dispose chemicals and pharmaceutical preparations safely	B2 Handle and dispose chemicals and pharmaceutical preparations in a safe way according to GLP principles	b2	All practical sessions		x			x			
3.9	Maintain public awareness on rational use of drugs and social health hazards of drug abuse and misuse	B16. Advise health care professionals & patients concerning awareness on rational use of drugs and social health hazards of drug abuse and misuse	b3	practical sessions	Practical notes		x			x		

4.2	Comprehend and apply GLP, GPMP, GSP and GCP guidelines in pharmacy practice	C3 Comprehend GLP, (GPMP), good storing practice (GSP) and good clinical practice (GCP) guidelines in pharmacy practice.	c2	Control of microbial spoilage Good Manufacture Practice Preservation of pharmaceutical products and preservatives commonly used Factors affecting preservative activity Evaluation of preservative's efficacy	Student book, Essential books	x x				x	X
4.8	Select and assess appropriate methods of infection control to prevent infections and promote public health	C13	c1- c3	Classification of antimicrobial agents: Antituberculous drugs Antileprosy agents Antifungal drugs Antiprotozoal drugs Antiviral drugs Microbial resistance Microbial assay of Antibiotics and vitamins	Student book, Essential books	x				x	X
					Student book, Essential books	x				x	X
5.1	Communicate clearly by verbal and means	D1	d1	All practical session	Practical sessions		x			x	

5.2.	Retrieve and evaluate information from different sources to improve professional competencies	D2	d2	Activity	Internet search		x		x	x	
5.9	Implement writing and thinking, problem-solving and decision-making abilities	D11	d3	Practical sessions	Internet and Recommended books	x	x		x		

