Zagazig University

Faculty of Pharmacy

Pharmaceutics Department

Program and Course Specifications

Master and Ph.D.

Degrees

2019

Master Degree

Program Specification

Program Specification

A- Basic Information

1- Program title: M.Pharm. Sci Degree in **Pharmaceutics**

2- Program type: Single

3- Faculty/ University: Faculty of Pharmacy, Zagazig University

4- Department: Pharmaceutics

5- Coordinator: Prof. Nagia ElMegrab

6- Date of program specification approval: 2019

7- Teaching language: English

8. External Evaluator: Prof. Ali abd Elzaher - Pharmaceutics department – Faculty of Pharmacy –Assiut University)

9. **Internal Evaluator:** Prof. Hanan ElNahas

10- Academic Reference Standards:

a. The program ILOs were compared to the general guideline for postgraduate studies, 1st Edition, February 2009 issued by (NAQAA) (National Authority for Quality Assurance and Accreditation).

b. The program ILOs were compared to the Master of Science Programme in Pharmaceutical Sciences at the Faculty of Health and Medical Sciences, University of Copenhagen

B- Professional Information

1- Program aims:

Master's program, Zagazig University is a 3-5 five years pharmacy education offering a Master's degree in pharmaceutical sciences (Pharmaceutics). This Program aims at providing postgraduate students with knowledge, skills and abilities needed to practice the pharmacy profession effectively in various settings including Research

Institutes, private and public medical laboratories, universities, National Quality Control Centers (foods & drugs) and Ministry of Health.

The program aims are summarized as follows:

1. acquire the necessary knowledge and skills in areas related to physical pharmacy, biopharmaceutics and pharmacokinetics, pharmaceutical technology, transdermal and controlled drug delivery as well as drug stability.

2. Develop various interpersonal skills including communication, time management, critical thinking, problem solving, decision making, team working, using modern information technology and self learning

1.1. Graduate attributes:

1- Have the fundamental and advanced knowledge in biopharmaceutics and pharmacokinetics, physical pharmacy and drug delivery.
2- Demonstrate ethical, legal, social and civic responsibility as a researcher and member of the discipline.
3- Analyze, evaluate information and solve professional problems
4- Conduct research, write and evaluate scientific reports
5- Develop continuous and self learning abilities
6- Demonstrate effective communication, decision making and leadership skills

2-Intended Learning Outcomes (ILOs):

The Program provides excellent opportunities for students to demonstrate knowledge and understanding qualities and develop skills appropriate for Pharmaceutics Master of sciences degree.

2-1- Knowledge and Understanding :

On successful completion of the Master degree Program, students will be able to:

A.1- Outline basic theories and principles of Physical Pharmacy,Biopharmaceutics and Pharmacokinetics, Pharmaceutical technology, Biostatistics, Biotechnology, drug induced diseases, Instrumental analysis, transdermal and controlled drug delivery as well as drug stability.

A.2- Illustrate the essential information about different drug induced diseases and appropriate methods of treatment.

A.3- Describe the basics for genetic engineering and principal and applications of PCR technology.

A.4- Explain the principles of physical pharmacy, different factors affecting drug release and bioavailability.

A.5- Demonstrate the role of pharmaceutical formulation in enhancing drug bioavailability and patient compliance.

A.6 - Outline basic principles of instrumental analysis, operation as well as applications of instrumental techniques

A.7 - Identify different factors affecting drug stability, regulations for stability testing and shelf-life determination.

A.8 – Illustrate different types of polymers as well as transdermal and controlled drug delivery systems, their formulation and therapeutic uses

A.9 - Mention the ethical and legal aspects for professional practices and research

2-2 - Intellectual Skills:

On successful completion of the Master degree Program, students will be able to:

B.1- Analyze and evaluate the information gained in the field of pharmaceutics to solve different problems.

B.2- Suggest proper and logic solutions to the research problems using the available information.

B.3- Plan to solve possible problems based on the integration of required pharmaceutical knowledge.

B.4- Conduct research and write scientific reports of the obtained data.

B.5-Deal effectively with risks and hazards during professional and laboratory practice.

B.6- Design the appropriate delivery system to enhance drug bioavailability.

B.7- Take professional decisions in the area of specialization.

2-3 - Professional and Practical Skills:

It is intended that, on successful completion of the Master degree Program, students will be able to:

C.1- Demonstrate skills in formulation, characterization and evaluation of different delivery systems.

C.2- Write reliable scientific reports in the form of published articles.

C.3- Apply and use advanced techniques in practical work.

2-4 - General and Transferable Skills:

On successful completion of the Master degree Program, students will be able to:

D.1- Communicate effectively with others.

D.2- Acquire computer skills in analyzing results and presenting them.

D.3-Show self assessment and plan to cover the needs.

D.4- Retrieve information from a variety of sources including libraries, databases and internet.

D.5- Evaluate performance of others and help them to develop the performance.

D.6- Work effectively as a member or leader of a team.

D.7- Get maximum use of time to achieve goals.

D.8- Develop continuous learning skills to improve the career.

3- Academic Standards:

Faculty is committed to the Academic References Standards for postgraduate studies (March 2009).

Matrix 1: Comparison of M. Pharm. Sci. Degree in pharmaceutics with the Academic Reference Standard {ARS, 2009} developed by NAQAAE

Attributes of the graduates (ARS, 2009)	Attributes of the graduates (M. Pharm. Sci. Degree in pharmacy practice)
1. Apply the specialized knowledge he has acquired in his professional practice	1-Have the fundamental and advanced knowledge in biopharmaceutics and pharmacokinetics, physical pharmacy and drug delivery.
2. Identify and solve professional problems 4. Use technology effectively in his professional practice 6. Use available resources efficiently	3- Analyze, evaluate information and solve professional problems 4-Conduct research, write and evaluate scientific reports
3.Show good communication and	6-Demonstrate effective

leadership skills 5. Take decisions using available information	communication, decision making and leadership skills
7. Aware of his role in community service and development	2-Demonstrate ethical, legal, social and civic responsibility as a researcher and member of the discipline.
8. Reflect commitment to integrity, credibility and accountability	
9. Be a lifelong learner and able to develop himself	5-Develop continuous and self learning abilities

Matrix 2: Comparison of M. Pharm. Sci. Degree in pharmaceutics with the Academic Reference Standard {ARS, 2009} developed by NAQAAE

	ARS (2009)	Program ILOs
Knowledge and Understanding	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A.1- Outline basic theories and principles of Physical Pharmacy,Biopharmaceutics and Pharmacokinetics, Pharmaceutical technology, Biostatistics, Biotechnology, drug induced diseases, Instrumental analysis, transdermal and controlled drug delivery as well as drug stability. A.2- Illustrate the essential information about different drug induced diseases and appropriate methods of treatment. A.3- Describe the basics for genetic engineering and principal and applications of PCR technology. A.4- Explain the principles of physical pharmacy, different factors affecting drug release and bioavailability.
	2.1.2- Mutual influence between professional practice and its impact on the environment.	A.5- Demonstrate the role of pharmaceutical formulation in enhancing drug bioavailability and patient compliance.
	2.1.3- Scientific developments in	A.8 – Illustrate different types of polymers

	ARS (2009)	Program ILOs
	the area of specialization.	as well as transdermal and controlled drug delivery systems, their formulation and therapeutic uses
	2.1.4- Moral and legal principles for professional practice in the area of specialization.	A.9 - Mention the ethical and legal aspects for professional practices and research
	2.1.5- Principles and the basics of quality in professional practice in the area of specialization.	A.6 - Outline basic principles of instrumental analysis, operation as well as applications of instrumental techniques A.7 - Identify different factors affecting drug stability, regulations for stability testing and shelf-life determination
	2.1.6- The fundamentals and ethics of scientific research.	A.9 - Mention the ethical and legal aspects for professional practices and research
Intellectual Skills	2.2.1- Analyze and evaluate information in the field of specialization and analogies to solve problems	B.1- Analyze and evaluate the information gained in the field of pharmaceutics to solve different problems.
	2.2.2- Solve specified problems in the lack or missing of some information.	B.2- Suggest proper and logic solutions to the research problems using the available information.
	2.2.3-Correlate and integrate different pharmaceutical knowledge to solve professional problems.	B.3- Plan to solve possible problems based on the integration of required pharmaceutical knowledge.

	ARS (2009)	Program ILOs
	2.2.4- Conduct research and write scientific report on research specified topics.	B.4- Conduct research and write scientific reports of the obtained data.
	2.2.5- Evaluate and manage risks and potential hazards in professional practices in the area of specialization	B.5-Deal effectively with risks and hazards during professional and laboratory practice.
	2.2.6- Plan to improve performance in the field of specialization.	B.6- Design the appropriate delivery system to enhance drug bioavailability.
	2.2.7- Professional decision-making in the contexts of diverse disciplines.	B.7- Take professional decisions in the area of specialization.
Professional and Practical Skills	2.3.1- Master basic and modern professional skills in the area of specialization.	C.1- Demonstrate skills in formulation, characterization and evaluation of different delivery systems.
	2.3.2- Write and evaluate professional reports.	C.2- Write reliable scientific reports in the form of published articles.
	2.3.3- Assess methods and tools existing in the area of specialization.	C.3- Apply and use advanced techniques in practical work.
Transferable skills	2.4.1- Communicate effectively.	D.1- Communicate effectively with others.

	ARS (2009)	Program ILOs
	2.4.2- Effectively use information technology in professional practices	D.2- Acquire computer skills in analyzing results and presenting them.
	2.4.3- Self-assessment and define his personal learning needs.	D.3-Show self assessment and plan to cover the needs.
	2.4.4- Use variable sources to get information and knowledge.	D.4- Retrieve information from a variety of sources including libraries, databases and internet.
	2.4.5- Set criteria and parameters to evaluate the performance of others	D.5- Evaluate performance of others and help them to develop the performance.
	2.4.6- Work in a team and lead teams carrying out various professional tasks.	D.6- Work effectively as a member or leader of a team.
	2.4.7- Manage time effectively.	D.7- Get maximum use of time to achieve goals.
	2.4.8- Continuous and self learning	D.8- Develop continuous learning skills to improve the career.

Matrix 3: Comparison of M. Pharm. Sci. Degree in pharmaceutics with Master of Science Programme in Pharmaceutical Sciences at the Faculty of Health and Medical Sciences, University of Copenhagen

	University of Copenhagen	Program ILOs
Knowledge	• Has knowledge at the highest international level in the key academic disciplines of drug discovery, development, production and application.	**Partially covered**
	• Can understand the chief multi-disciplinary processes and relationships between the main phases of drug development on the basis of knowledge of the individual academic disciplines.	**Partially covered** Pharmaceutical technology Instrumental analysis drug stability
	• Has, regardless of programme speciality, broad knowledge of pharmacology and physiology, medicinal chemistry, the formulation and production of pharmaceuticals and related disciplines. Also understands and is able to reflect over the correlation between these disciplines in relation to how drugs ultimately influence disease in humans, and how complex biosystems influence drugs in the widest sense.	A.1- Outline basic theories and principles of Physical Pharmacy, Biopharmaceutics and Pharmacokinetics, Pharmaceutical technology, Biostatistics, Biotechnology, drug induced diseases, Instrumental analysis, transdermal and controlled drug delivery as well as drug stability. A.2- Illustrate the essential information about different drug induced diseases and appropriate

	University of Copenhagen	Program ILOs
		methods of treatment. A.3- Describe the basics for genetic engineering and principal and applications of PCR technology. A.4- Explain the principles of physical pharmacy, different factors affecting drug release and bioavailability. A.5- Demonstrate the role of pharmaceutical formulation in enhancing drug bioavailability and patient compliance. A.8 – Illustrate different types of polymers as well as transdermal and controlled drug delivery systems, their formulation and therapeutic uses
	• Can understand and identify scientific problems in the areas of drug discovery, development, production and application in society.	**Partially covered** A.6 - Outline basic principles of instrumental analysis, operation as well as applications of instrumental techniques A.7 - Identify different factors affecting drug stability, regulations for stability testing and shelf-life determination

	University of Copenhagen	Program ILOs
	• Has knowledge of the national and international regulatory requirements as well as the quality standards set for the drug development process on the whole	A.9 - Mention the ethical and legal aspects for professional practices and research
Skills	• Masters key scientific experimental methods related to academic disciplines: quantitative analysis of data, complex mathematical calculations, scientific reporting including assessing and discussing experimental or collected data, a critical approach to literature in the field, quality assurance and knowledge of the requirements that general and scientific ethics place on these methods in terms of drug development.	B.1- Analyze and evaluate the information gained in the field of pharmaceutics to solve different problems. C.1- Demonstrate skills in formulation, characterization and evaluation of different delivery systems. C.2- Write reliable scientific reports in the form of published articles. D.4- Retrieve information from a variety of sources including libraries, databases and internet.
	• Based on interdisciplinary understanding is able to propose and formulate model solutions and methods of analysis to solve multidimensional problems in the areas of drug discovery, development, production and application.	B.2- Suggest proper and logic solutions to the research problems using the available information. B.3- Plan to solve possible problems based on the integration of required pharmaceutical knowledge. B.5-Deal effectively with risks and hazards during professional and

	University of Copenhagen	Program ILOs
		laboratory practice. B.6- Design the appropriate delivery system to enhance drug bioavailability. B.7- Take professional decisions in the area of specialization. C.3- Apply and use advanced techniques in practical work.
	• Is able to present, communicate and discuss interdisciplinary knowledge and drug-related problems with colleagues, other specialists and non-specialists.	D.1- Communicate effectively with others.
Competences	Is able to assess complex problems in the areas of drug discovery, development, production and application, and on the basis of interdisciplinary skills is able to formulate hypotheses and model solutions, either independently or in interdisciplinary collaboration.	B.4- Conduct research and write scientific reports of the obtained data.
	Can independently take responsibility for continuing to develop within an interdisciplinary environment as well as area of specialisation: drug discovery or development, medicine and society.	D.3-Show self assessment and plan to cover the needs. D.8- Develop continuous learning skills to improve the career.
	Is able to make a constructive contribution to collaboration or lead multidisciplinary project groups in	D.5- Evaluate performance of others and help them to develop the

	University of Copenhagen	Program ILOs
	certain phases of drug development or in connection with communication between the pharmaceutical industry and health authorities based on area of specialisation.	performance. D.6- Work effectively as a member or leader of a team. D.7- Get maximum use of time to achieve goals.
	In an interdisciplinary area can integrate complex information and think analytically, creatively, innovatively and reflectively in order to solve problems in the areas of drug discovery, industry and public authorities.	D.2- Acquire computer skills in analyzing results and presenting them.

5-Curriculum Structure and Contents:

a- Program duration: **3- 5** years

b- Program structure:

- The Masters program can be completed in 3-5 years.
- The Faculty of pharmacy implements the credit hour system.
- The program is structured as:

1- Courses: General (1 year) and Special

No. of credit hours for program courses:

Compulsory: 12

Elective: (2x4) 8

Special: (3x4) 12

2- Thesis: 30 hours

The candidate must complete a research project on an approved topic in the Pharmaceutical Sciences. To fulfill this requirement the student must present (written and orally) a research proposal and write a thesis.

3- General University Requirements: 10 credit hours including:

a- TOEFL (400 units)

b- Computer course

c-Program Curriculum:

Course Code	Course Title	Credit hours	Program ILOs Covered
	General Courses:		
M103	1- Physical Pharmacy	2	A1, A4, A8, B3, D2, D6
M104	2- Biopharmaceutics and Pharmacokinetics	2	A1, A4, B3, D2, D4
ME1	3- Pharmaceutical technology	2	A1, A6, A8, B3 D2, D4, D6
M111	4- Biostatistics	2	A1, B1, D1, D2
M102	5- Instrumental analysis& ChromatographyII	4	A1, A6, B3, D2, D6
ME4	6- Elective A Biotechnology	4	A1, A3, B1, D2, D4,D6
ME5	7- Elective B Applied Pharmacology	4	A2, B3, B7, D3

ME7	Drug induced diseases	4	A1, A2, B5, D1, D4
	Special Courses:		
Esp1	Controlled release dosage forms	4	A1, A8, B2, D8, D4
Esp2	Drug stability	4	A1, A7, B5, D1, D2
Esp3	Transdermal drug delivery systems	4	A1, A8, B1, D3
	Thesis	30	A1, A2, A3, A4, A5, A6, A7, A8, A9, B1, B2, B3, B4, B5, B6, B7, C1, C2, C3, D1, D2, D3, D4, D5, D6, D7, D8

6-Program admission requirements:

- The Applicant should finish or being permanently or temporarily exempted from the military service and temporary exemption should be valid for at least one year from the date of beginning of study. (Exceptions apply for demonstrators and assistant lecturers).
- The applicant admission to the M.Sc. program should be no later than ten years from the time of graduation.
- Acquisition of an approval from the Faculty Council following an approval of concerned Departmental Board as well as Graduate Studies and Research Committee recommendation

within a maximum of one month for any conditions stated by the concerned Departmental Board.

Admission Conditions for M.Sc. degree

In addition to the general admission conditions stated before, applicants are admitted to M.Sc. degree upon fulfillment of the following:

The applicants should be holders of Bachelor in Pharmaceutical Sciences from any Faculty of Pharmacy with a general grade at least good (cancelled by a decision of the university council) affiliated to the Egyptian Universities or an equivalent degree granted by any institute recognized by the Supreme Council of Universities.

The Faculty council is allowed, on consent of the concerned Departmental Board as well as Graduate Studies and Research Committee, to accept student for registration of M.Sc. degree if he has got a diploma from one of the Egyptian Universities in one of the pharmaceutical sciences fields, Faculties, or Institutes that are recognized by the Supreme Council of Universities with a general grade of Good regardless his grades in bachelor degree.

Students should fulfill all the admission requirements stated by the concerned Departmental Board (ICDL certificate, local TOEFL certificate with a grade at least 450).

Admission has to be done within the period announced by the university. Candidate thesis discussion isn't before one calendar year from research point registration.

Regulations to complete the program:

The Faculty Council, in compliance with the concerned Departmental Board as well as Graduate Studies and Research

Committee recommendation awards the M.Sc. degree upon fulfillment of the following requirements:

- Carrying out a deep research in the area of specialization for at least one or two calendar years and at most three years from the time of registration.
- The student has to succeed in all courses examinations.
- Acceptance of the research thesis by the Jury Committee according to statement 104 of universities regulating law.

Cancellation of Registration

The Faculty Board is allowed to cancel registration for M. Sc. programs in the following circumstances

- Student's failure to pass the course examinations for two times.
- Student's nonattendance or unsatisfactory progress (at least two annual reports) in research work being reported by the advisors and chief supervisor to the Departmental Board and forwarded to the Graduate Studies and Research Committee recommendation for approval of cancellation.
- Dissertation refusal by the Jury Committee.
- Incapability of the student to graduate by the deadlines indicated.

7- Admission Policy:

The faculty complies with the admission regulations and requirements of the Egyptian Supreme Council of Universities (ESCU).

8-Student assessment methods:

Method	ILOS

Written exam	Knowledge and Understanding and Intellectual Skills
Oral exam	Knowledge and Understanding ,Intellectual Skills and General and Transferable Skills
Activity	Intellectual Skills and General and Transferable Skills
Seminars	Knowledge and Understanding ,Intellectual Skills & General and Transferable Skills
Follow up	Professional and practical Skills & General and Transferable Skills
Thesis and oral presentation	Knowledge and Understanding, Intellectual Skills, Professional and practical Skills & General and Transferable Skills

Grade Scale	Grade point average value (GPA)	Numerical scale
A+	5	≥ 95%
A	4.5	90- < 95%
B+	4	85- < 90%
B	3.5	80- < 85%
C+	3	75- < 80%
C	2.5	70- < 75%
D+	2	65- < 70%
D	1.5	60- < 65%

9-Failure in Courses:

Students who fail to get 60% (1 point)

10-Methods of program evaluation

Evaluator	Method	Sample
Internal evaluator Prof. Hanan ElNahas	Program evaluation Courses evaluation	Program report Courses report
External evaluator Prof. Ali Abd Elzaher, Assiut University	Program evaluation Courses evaluation	Program report Courses report
Others methods	Matrix with ARS International Benchmark Questionnaires	**100%**

تم اعتماد التوصيف بمجلس القسم بتاريخ

Biopharmaceutics and pharmacokinetics

Course specification of Biopharmaceutics and pharmacokinetics

A- Course specifications:

- **Program on which the course is given:** Master of Pharmaceutical Sciences
- **Major or Minor element of program:** Major
- **Department offering the program:** Pharmaceutics Dept.
- **Department offering the course:** Pharmaceutics Dept.

- **Date of specification approval:** 2019

1- Basic information:

Title: **Biopharmaceutics and pharmacokinetics** Code: M 104
Lectures: 2 hrs/week Credit hours: 2 hrs/week
Total: 2 hrs/week

2- Overall aim of the course:

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

Describe the principles and applications of Biopharmaceutics and pharmacokinetics.

3- Intended learning outcome s (ILOs) of Biopharmaceutics and pharmacokinetics:

Knowledge and Understanding	
a1	Outline different pharmacokinetic parameters and bioavailability
a2	Enumerate different factors affecting the rate of absorption, distribution, biotransformation and elimination of drugs.
a3	State the applications of pharmacokinetics in different clinical situations
Intellectual skills	
b1	Select the appropriate methods for estimation of bioavailability and drug clearance in the body
b2	Apply pharmacokinetic strategies for modifying drug action.
General and Transferable skills	
d1	Use computer skills to present information
d2	Collect information from a variety of sources

4. Course Content of Biopharmacutics and pharmacokinetics:

Week number	Lecture content (2 hrs/week)
1	Factors affecting bioavailability (biological and physiological)
2	Physicochemical factors, advantages and disadvantages of oral administration.
3	Distribution and factors affecting it.
4	Elimination , biotransformation, and urinary excretion .
5	Minor routes of drug elimination
6	Use of physical and animal models to evaluate bioavailability.
7	Review on bioequivalence study through revision of certain scientific research papers. **Activity**
8	Pharmacokinetic models, volume of distribution, and total body clearance.
9	Problems in determination of bioavailability of urine and saliva sample.
10	Loading dose, steady state, lag time, and flip-flop.

11	Method of residuals, therapeutic drug monitoring, and dosage regimen design.
12	Pharmacokinetic parameters.
13	Kidney and liver function tests.
14	Haemodialysis.
15	Final exam

5- Teaching and Learning Methods:

- Lectures
- Self learning
- Critical thinking

6- Student Assessment methods:

Written exams to assess: a1, a2, a3, b1, b2
Oral exam to assess: a1, a2, a3, b1, b2
Activities to assess: d1, d2

Assessment method	Time	Marks	Percentage
Written exam	Week 15	75	75%
Oral exams	Week 15	15	15%
Activities	Week 7	10	10%
Total	-----	100	100%

7- References and books:

A-Scientific papers:

Panchagnula R, Thomas NS. Biopharmaceutics and pharmacokinetics in drug research. Int J Pharm. 2000 May 25;201(2):131-50

B- Essential books:

Ashutosh Kar, Essentials of Biopharmaceutics and Pharmacokinetics, Elsevier, 2010

C- Suggested books:

Applied Biopharmaceutics and Pharmacokinetics Shargel, L., and Andrew B.C.,VU. Sixth edition, East Norwalk, Connecticut, USA (2012).

D- Websites:

Pubmed, Sciencedirect, Nejm, Weily interscience

Facilities required for teaching and learning:

1. **For lectures:** Black (white) boards, computers and data show.

- **Course Coordinators: Prof Dr/ Fakhr El-din Ghazy**
- **Head of Department: Prof Dr/ Nagia Ahmed El-Megrab**
- **Date:** **تم اعتماد التوصيف بمجلس الكلية رقم بتاريخ 23-9-2019**

Matrix I of Biopharmaceutics and Pharmacokinetics

	Course Contents	ILOs of Biopharmaceutics and Pharmacokinetics course						
		Knowledge and understanding			Intellectual skills		Transferable and general skills	
		a1	a2	a3	b1	b2	d1	d2
1	Factors affecting bioavailability (biological and physiological)		x					
2	Physicochemical factors, advantages and disadvantages of oral administration.		x					
3	Distribution and factors affecting it.		x					
4	Elimination , biotransformation, and urinary excretion .		x					
5	Minor routes of drug elimination		x					
6	Use of physical and animal models to evaluate bioavailability.	x						
7	Review on bioequivalence study through revision of certain scientific research papers.			x		x	x	x
8	Pharmacokinetic models, volume of distribution, and total body clearance.	x						
9	Problems in determination of bioavailability of urine and saliva sample.	x			x			
10	Loading dose, steady state, lag time, and flip-flop.	x			x			
11	Method of residuals, therapeutic drug monitoring, and dosage regimen design.	x		x	x	x		
12	Pharmacokinetic parameters.	x			x			
13	Kidney and liver function tests.			x				
14	Haemodialysis.			x				

Matrix II of Biopharmaceutics and pharmacokinetics										
ARS		**Program ILOs**	**Course ILOs**	**Course contents**	**Sources**	**Teaching and learning methods**		**Method of assessment**		
						Lecture	Self learning	Written exam	Oral exam	Activity
2.1	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A.1- Outline basic theories and principles of Physical Pharmacy,Biopharmaceutics and Pharmacokinetics, Pharmaceutical technology, Biostatistics, Biotechnology, drug induced diseases, Instrumental analysis, transdermal and controlled drug delivery as well as drug stability. .	a1	Factors affecting bioavailability (biological and physiological) Physicochemical factors, advantages and disadvantages of oral administration. Distribution and factors affecting it. Elimination , biotransformation, and urinary excretion. Minor routes of drug elimination	Textbooks, Scientific papers and self learning	x	x	X	x	
			a3	Kidney and liver function tests. Haemodialysis.	Textbooks, Scientific papers and self learning	x	x	X	x	

				Pharmacokinetic models, volume of distribution, and total body clearance. Loading dose, steady state, lag time, and flip-flop. Method of residuals, therapeutic drug monitoring, and dosage regimen design.	Textbooks, Scientific papers and self learning	x	x	X	x	
2.2		A.4- Explain the principles of physical pharmacy, different factors affecting drug release and bioavailability	a2	Use of physical and animal models to evaluate bioavailability. Review on bioequivalence study through revision of certain scientific research papers. Problems in determination of bioavailability of urine and saliva sample.	Textbooks, Scientific papers and self learning	x	x	x	x	
	2.2.3-Correlate and integrate different pharmaceutical knowledge to solve professional problems.	B.3- Plan to solve possible problems based on the integration of required pharmaceutical knowledge.	b1 b2	Pharmacokinetic models, volume of distribution, and total body clearance Loading dose, steady state, lag time, and flip-flop. Method of residuals, therapeutic drug monitoring, and dosage regimen design. Pharmacokinetic	Textbooks, Scientific papers and self learning	x	x	X		

				parameters. Kidney and liver function tests. Haemodialysis.						
2.4	2.4.2- Effectively use information technology in professional practices	D.2- Acquire computer skills in analyzing results and presenting them.	d2	Activity	Textbooks, Scientific papers and self learning		x			**x**
	2.4.4- Use variable sources to get information and knowledge.	D.4- Retrieve information from a variety of sources including libraries, databases and internet.	d1	Activity	Textbooks, Scientific papers and self learning		x			**x**

Pharmaceutical Technology

|Course specification of Pharmaceutical Technology

A- Course specifications:

- **Program on which the course is given:** Master of Pharmaceutical Sciences
- **Major or Minor element of program:** Major
- **Department offering the program:** Pharmaceutics Dept.
- **Department offering the course:** Pharmaceutics Dept.
- **Date of specification approval:** 2019

1- Basic information:

Title: **Pharmaceutical technology** Code: ME1
Lectures: 2 hrs/week Credit hours: 2 hrs/week
Total: 2hrs/week

2- Overall aim of the course:

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

Illustrate the principles and mechanisms of different apparatus used in granulation, tablet manufacture, particle size reduction and mixing as well as sterilization.

3- Intended learning outcome s (ILOs) of Pharmaceutical Technology:

Knowledge and Understanding	
a1	Outline different preformulation studies as well as packaging materials
a_2	Describe principles and mechanisms of different pharmaceutical processes including granulation, mixing, milling and sterilization
a_3	Describe tablet manufacturing and tablet coating
a_4	Explain micromeritics and methods for particle size control
Intellectual skills	
b1	Apply pharmaceutical background for solving problems in manufacturing
General and Transferable skills	
d1	Retrieve information from different sources

d2	Present data as a report or presentation
d3	work as a member of a team

4. Course Content of Pharmaceutical Technology:

Week number	Lecture content (2 hr/w)
1	• Preformulation
2	• Material of fabrication and corrosion
3	• Granulation and factors affecting it
4	• Tablet manufacture
5	• Types of tablet coating
6	• Sterilization
7	• Packs of pharmaceutical preparation
8	• Size reduction and factors affecting it
9	• Technique of milling
10	• Wet and dry milling , types of mill
11	• Determination of particle size
12	• Micromeritic and methods of particle size control • Activity: Internet search & data presentation about particle size control for enhancement of drug bioavailability
13	• Factors affecting solid mixing
14	• Tumbling and agitator mixers and mixers for semisolid
15	• Final exam

5- Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion

6- Student Assessment methods:

Written exams to assess: a1, a2, a3, a4, b1
Oral exam to assess: a1, a2, a3, a4, b1
Activities to assess: d1, d2, d3

Assessment method	Time	Marks	Percentage
Written exam	Week 15	75	75%
Oral exams	Week 15	15	15%
Activities	Week 12	10	10%
Total	------	100	100%

7- References and books:

A- Essential books:

Bentley's text book of Pharmaceutics by Rawlins, E. A. 8th ed (1984).

Ajay Semalty, Mona Semalty, M.s.M. Rawat. Essentials of Pharmaceutical Technology. PharmaMed Press. Second edition, 2018

B- Suggested books:

S C Dinda. Advances in Pharmaceutical Technology, Bsp Books Pvt. Ltd. (November 4, 2014)

The theory and Practice of Industrial Pharmacy (1976) by Lachman, L., Lieberman, H. A., Kanig, J. L., Lea and Febiger, Philidelphia, USA.

C- Websites:

Pubmed, Sciencedirect, Nejm, Weily interscience

Facilities required for teaching and learning:

1. **For lectures:** Black (white) boards, Computers, data show.

- **Course Coordinators: Prof Dr/ Fakhr El-din Ghazy**
- **Head of Department: Prof Dr/ Nagia Ahmed El-Megrab**
- **Date:2019-9-23 تم اعتماد التوصيف بمجلس الكلية رقم بتاريخ**

Matrix I of Pharmaceutical technology

Course Contents		ILOs							
		Knowledge and understanding				Intellectual skills	Transferable and general skills		
		a1	a2	a3	a4	b1	d1	d2	d3
1	Preformulation	x				x			
2	Material of fabrication and corrosion	x							
3	Granulation and factors affecting it		x						
4	Tablet manufacture			x		x			
5	Types of tablet coating			x		x			
6	Sterilization	x							
7	Packs of pharmaceutical preparation	x							
8	Size reduction and factors affecting it				x				
9	Technique of milling				x				
10	Wet and dry milling , types of mill				x				
11	Determination of particle size				x				
12	Micromeritic and methods of particle size control				x	x	x	x	x
13	Factors affecting solid mixing	x							
14	Tumbling and agitator mixers and mixers for semisolid	x							

Matrix II of Pharmaceutical technology										
ARS		**Program ILOs**	**Course ILOs**	**Course contents**	**Sources**	**Teaching and learning methods**		**Method of assessment**		
						Lecture	Self learning	Written exam	Oral exam	Activity
2.1	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A.1- Outline basic theories and principles of Physical Pharmacy,Biopharmaceutics and Pharmacokinetics, Pharmaceutical technology, Biostatistics, Biotechnology, drug induced diseases, Instrumental analysis, transdermal and controlled drug delivery as well as drug stability.	a1	Preformulation Material of fabrication and corrosion Sterilization Packs of pharmaceutical preparation Factors affecting solid mixing Tumbling and agitator mixers and mixers for semisolid	Textbooks, Scientific papers and self learning	x	x	x	x	

	2.1.3- Scientific developments in the area of specialization.	A.8 – Illustrate different types of transdermal and controlled drug delivery systems, their formulation and therapeutic uses	a3	Manufacturing of compressed tablet Methods of tablet manufacturing Apparatus for continuous and patch filtration	Textbooks, Scientific papers and self learning	x	x	x	x	
	2.1.5- Principles and the basics of quality in professional practice in the area of specialization	A.6 - Outline basic principles of instrumental analysis, operation as well as applications of instrumental techniques	a2	Evaluation of tablets Sterilization Methods of sterilization	Textbooks, Scientific papers and self learning	x	x	x	x	
	2.2.3-Correlate and integrate different pharmaceutical knowledge to solve professional problems.	B.3- Plan to solve possible problems based on the integration of required pharmaceutical knowledge.	b1	Methods of tablet manufacturing - Evaluation of tablets -Apparatus for continuous and patch filtration - Sterilization - Methods of sterilization	Textbooks, Scientific papers and self learning	x	x	x	x	
2.4	2.4.2- Effectively use information technology in professional practices	D.2- Acquire computer skills in analyzing results and presenting them.	d2	Activity	Textbooks, Scientific papers and self learning		x			**x**

	2.4.4- Use variable sources to get information and knowledge.	D.4- Retrieve information from a variety of sources including libraries, databases and internet.	d1	Activity	Textbooks, Scientific papers and self learning		x			**x**
	2.4.6- Work in a team and lead teams carrying out various professional tasks.	D.6- Work effectively as a member of team.	d3	Activity	Textbooks, Scientific papers and self learning		x			**x**

Physical Pharmacy

Course specification of Physical Pharmacy

A- Course specifications:

- **Program on which the course is given:** Master of Pharmaceutical Sciences
- **Major or Minor element of program:** Major
- **Department offering the program:** Pharmaceutics Dept.
- **Department offering the course:** Pharmaceutics Dept.
- **Date of specification approval:** 2019

1- Basic information:

Title: **Physical pharmacy** Code: M103
Lectures: 2 hrs/week Credit hours: 2 hrs/week
Total: 2 hrs/week

2- Overall aim of the course:

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

On completion of the course, the students will be able to acquire knowledge of the principles of physical pharmacy, design, evaluate and interpret the therapeutic efficacy of homogenous and heterogeneous dosage forms and understand the implications of the physical interactions on the outcome of the drug product and discuss recent trends in applied physical pharmacy.

3- Intended learning outcomes (ILOs) of Physical Pharmacy:

A-Knowledge and Understanding	
a1	Illustrate the principles of physical pharmacy including equilibrium phenomena, dissolution, phase equilibrium, phase rule, types of flow, interfacial phenomena and disperse systems
a2	Outline structure of polymers and their applications in pharmacy
a3	Differentiate between different complexes, their applications and analysis
B-Intellectual skills	
b1	Integrate physical pharmacy background in dissolving formulation problems
C-General and Transferable skills	
d1	Develop computer skills in presenting data
d2	Work effectively as a team member

4. Course Content of Physical pharmacy:

Week number	Lecture content (2 hr/w)
1	• Equilibrium phenomena (Strong and weak acid, bases, buffers, distribution).
2	• Complexation and protein binding.
3	• Drug release &dissolution.
4	• Types of flow
5	• Surface and interfacial phenomena
6	• Metal complexes &Organic molecular complexes
7	• Occlusion compounds, Complexation and method of analysis **(Presentation)**
8	• State of matter • Ideal gas law
9	• Colligative properties of solutions
10	• Phase rule
11	• Disperse systems

12	• Phase equilibria
13	• Polymer science
14	• Revision & **(Final Presentation)**
15	Final exam

5- Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion

6- Student Assessment methods:

Written exams to assess: a1, a2, a3, b1
Oral exam to assess: a1, a2, a3, b1
Activities to assess: d1, d2

Assessment method	Time	Marks	Percentage
Written exam	Week 15	75	75%
Oral exams	Week 15	15	15%
Activities	Week 7, 14	10	10%
Total	------	100	100%

7- References and books:

A- Essential books:

i- Martin's physical pharmacy and pharmaceutical sciences: Patrick J. Sinko, Alfred N. Martin, Lippincott Williams & Wilkins, (2006)

ii- Pharmaceutical calculations, Stoklosa, M and Ansel, H., Philadelphia, London. (1997).

B- **Recommended books:**

Bandameedi Ramu, hand book of physical pharmacy, Pothi, 2018.

C- Websites: Pubmed, Sciencedirect, Weilyinterscience

Facilities required for teaching and learning:

1. **For lectures:** Black (white) boards, data show.

- **Course Coordinators: Prof Dr/ Hanan Mohamed El-Nahas**
- **Head of Department: Prof Dr/ Nagia Ahmed El-Megrab**
- **Date: تم اعتماد التوصيف بمجلس الكلية رقم بتاريخ 2019-9-23**

Matrix I of Physical Pharmacy							
Course Contents		ILOs of Physical pharmacy course					
		Knowledge and understanding			Intellectual skills	Transferable and general skills	
		a1	a2	a3	b1	d1	d2
1	Equilibrium phenomena (Strong and weak acid, bases, buffers, distribution).	x					
2	Complexation and protein binding.			X	x		
3	Drug release &dissolution.	x					
4	Types of flow						
5	Surface and interfacial phenomena	x					
6	Metal complexes &Organic molecular complexes			X	x		
7	Occlusion compounds, Complexation and method of analysis Presentation			X	x	X	x
8	State of matter Ideal gas law	x					
9	Colligative properties of solutions	x			x		
10	Phase rule	x					
11	Disperse systems	x					
12	Phase equilibria	x					
13	Polymer science		x				
14	presentation					x	x

Matrix II of Physical Pharmacy										
ARS		**Program ILOs**	**Course ILOs**	**Course contents**	**Sources**	**Teaching and learning methods**		**Method of assessment**		
						Lecture	Self learning	Written exam	Oral Exam	Activity
2.1	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A.1- Outline basic theories and principles of Physical Pharmacy,Biopharmaceutics and Pharmacokinetics , Pharmaceutical technology, Biostatistics, Biotechnology, drug induced diseases, Instrumental analysis, transdermal and controlled drug delivery as well as drug stability. A.4- Explain the principles of physical pharmacy, different factors	a1 a3	Equilibrium phenomena (Strong and weak acid, bases, buffers, distribution). Drug release &dissolution. Surface and interfacial phenomena State of matter Ideal gas law Colligative properties of solutions Phase rule Disperse systems Phase equilibria Complexation and protein binding. Metal complexes &Organic molecular complexes Occlusion compounds, Comlexation and method of analysis	Textbooks, Scientific papers and self learning	X	X	x	x	

		affecting drug release and bioavailability.								
	2.1.3- Scientific developments in the area of specialization.	A.8 – Illustrate different types of transdermal and controlled drug delivery systems, their formulation and therapeutic uses	a2	Polymer science	Textbooks, Scientific papers and self learning	X	X	x	x	
	2.2.3-Correlate and integrate different pharmaceutical knowledge to solve professional problems.	B.3- Plan to solve possible problems based on the integration of required pharmaceutical knowledge.	b1	Colligative properties of solutions Complexation and protein binding. Metal complexes &Organic molecular complexes Occlusion compounds, Complexation and method of analysis	Textbooks, Scientific papers and self learning	X	X	x	X	
2.4	2.4.2- Effectively use information technology in professional practices	D.2- Acquire computer skills in analyzing results and presenting them.	d1	Activity	Textbook s, Scientific papers and self learning		x			**x**

	2.4.6- Work in a team and lead teams carrying out various professional tasks.	D.6- Work effectively as a member or leader of a team.	d2	Activity	Textbooks, Scientific papers and self learning		X			**x**

Biostatistic

Course specification of Biostatistics

A- Course specifications:

- Program on which the course is given: Master of Pharmaceutical Sciences
- Major or Minor element of program: Major
- Department offering the program: Pharmaceutics Dept.
- Department offering the course: Pharmacology Dept.

- Date of specification approval: 2019

1- Basic information:

Title: **Biostatistics** Code: **M111**
Lectures: 2 hrs/week Credit hours: 2 hrs/week
Total: 2hrs/week

2- Overall aim of the course:

On completion of the course, the students will be able to design a good research experiment, statistically analyze the results of research experiments, and interpret the results of statistical analysis of experimental data using statistical computer programs.

3. Intended learning outcome s (ILOs) of Biostatistics:

Knowledge and Understanding	
a1	Identify the fundamentals and principles of Biostatistics.
a2	List the different methods of statistical analysis.
Intellectual skills	
b1	Analyze statistically and interpret data obtained from pharmacological experiments in different forms.
b2	Assess the types of decision errors that can occur during using statistical tests.
General and Transferable skills	
d1	Communicate effectively with others
d2	Develop IT skills

4. Course Content of Biostatistics:

Week number	Lecture contents (2hrs/week)
1	Computer-aided general Principle of biostatistics 1
2	Computer-aided General Principle of biostatistics 2
3	Computer-aided Presentation of data
4	Computer-aided Descriptive statistics
5	Computer-aided Measures of central tendency
6	Computer-aided Measures of variability
7	Computer-aided Normal frequency distribution curve
8	Probability
9	Comparing of two means **Activity**
10	Comparing of more than two means
11	Chi square test
12	Computer-aided Regression and correlation analysis
13	Complex analysis
14	Criteria of good experimental design

15	final exam

5- Teaching and Learning Methods:

- Lectures
- Self-learning
- Computer statistical program training
- Open discussion

6- Student Assessment methods:

- Written exam to assess: a1, a2, b1 and b2.
- Oral exam to assess: a1, a2, b1, b2 and d1.
- Activity to assess: d1, d2

Assessment schedule:

Assessment (1): Activity	Week 9
Assessment (2): Written exam	Week 15
Assessment (3): oral exam	Week 15

Weighting of Assessment:

Assessment method	Marks	Percentage
• Activity	10	10 %
• Written exam	75	75 %
• oral exam	15	15 %
TOTAL	**100**	**100%**

8- References and books:

A-Scientific papers

B- Essential books:

- Danial W (1995). Biostatistics: A foundation for analysis in health science. (6th ed.) New York: John Wipij & sensing

C- Electronic resources

- Dom Spina (2003) Statistics Workshop distance learning material. British Pharmacological Society University of Manchester

Facilities required for teaching and learning:

1. **For lectures:** Black (white) boards, computer, data show.

- **Course Coordinators: Prof. Hany Elbassosy**
- **Head of Department: Prof. Mona Fouad**

Matrix I of Biostatistics course							
Week number	Course Contents	Knowledge & understanding		Intellectual skills		General & Transfer able skills	
		a1	**a2**	**b1**	**b2**	**d1**	**d2**
1	General principle of biostatistics 1	x	x				
2	General principle of biostatistics 2		x				
3	Presentation of data	x		X			
4	Descriptive statistics	x		X			x
5	Measures of central tendency	x					x
6	Measures of variability	x					x
7	Normal frequency distribution curve	x		X			x
8	Probability	x		X			x
9	Comparing of two means- Activity	x	x	X		X	x
10	Comparing of more than two means	x	x	X			x
11	Chi square test	x	x	X			x
12	Regression and correlation analysis	x	x	X			x
13	Complex analysis		x	X			x
14	Criteria of good experimental design				x		

Matrix II of Biostatistics

ARS		Program ILOs	Course ILOs	Course content	Source	Teaching and learning methods		Method of Assessment		
						Lectures	Self learning	Written exam	Oral exam	Activity
Knowledge and Understanding	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A.1- Outline basic theories and principles of Physical Pharmacy,Biopharmaceutics and Pharmacokinetics, Pharmaceutical technology, Biostatistics, Biotechnology, drug induced diseases, Instrumental analysis, transdermal and controlled drug delivery as well as drug stability.	a1 a2	General principle of biostatistics 1- Presentation of data - Descriptive statistics - Measures of central tendency - Measures of variability - Normal frequency distribution curve - Probability - Comparing of two means - Comparing of more than two means - Chi square test - Regression and correlation analysis	Scientific papers, text books and Internet	X	X	x	x	

Intellectual Skills	2.2.1- Analyze and evaluate information in the field of specialization and analogies to solve problems	B.1- Analyze and evaluate the information gained in the field of pharmaceutics to solve different drug formulation problems.	b1 b2	Presentation of data - Descriptive statistics - Normal frequency distribution curve - Probability - Comparing of two means - Comparing of more than two means - Chi square test - Regression and correlation analysis - Complex analysis Criteria of good experimental design	Scientific papers, text books and Internet	X	x	x	x	
	2.4.1- Communicate effectively.	D.1- Communicate effectively with others	d1	Activities- Revision	Scientific papers, text books and Internet	x	x		x	x

General & Transferable skills	2.4.2- Effectively use information technology in professional practices	D.2- Acquire computer skills in analyzing results and presenting them.	d2	Activities- Revision	Scientific papers, text books and Internet	X	x		x	x

Drug-Induced Diseases

Course specification of Drug-Induced Diseases

A- Course specifications:

- Program on which the course is given: Master of Pharmaceutical Sciences
- Major or Minor element of program: Major
- Department offering the program: Pharmaceutics Dept
- Department offering the course: Pharmacology Dept.
- Date of specification approval: 2019

1- Basic information:

Title: **Drug Induced Diseases** Code:ME7
Lectures: 4 hrs/week Credit hours: 4 hrs/week
Total: 4hrs/week

2- Overall aim of the course:

On completion of the course, the students will be able to define the mechanisms, symptoms and diagnosis of drug-induced diseases and possible preventative methods.

3. Intended learning outcome s (ILOs) of Drug Induced Disease:

Knowledge and Understanding	
a1	Explain the basics of drug kinetics, dynamics and adverse effects
a2	Identify common diseases induced by drugs and the associated risk factors.
Intellectual skills	
b1	Suggest possible ways to protect against or minimize some common drug-induced diseases.
b2	Specify the hazards of therapeutic regimens and how to properly select suitable regimens in different pathological conditions.
General and Transferable skills	
d1	Communicate effectively with others
d2	Retrieve information from different resources

4. Course Content of Drug Induced Disease:

1	Introduction to drug induced-diseases
2	Drug-induced hepatotoxicity (Toxic response of the liver and mechanism of toxicity)
3	Drug-induced hepatotoxicity (Diagnosis and management)
4	Drug-induced nephrotoxicity (Toxic response of the kidney and mechanism of toxicity)
5	Drug-induced nephrotoxicity (Diagnosis and management)
6	Drug-induced CVS diseases (Toxic response of the heart and vascular system)
7	Drug-induced CVS diseases (Mechanism of toxicity)
8	Drug-induced CVS diseases (Diagnosis and treatment)
9	Activity
10	Drug-induced CNS diseases (Structure and functions of brain blood barrier, toxic response of brain and spinal cord)
11	Drug-induced CNS diseases (Mechanism of toxicity)

12	Drug-induced CNS diseases (Diagnosis and treatment)
13	Presentations
14	Open discussion & revision
15	Final exam

5- Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion

6- Student Assessment methods:

- Written exam to assess: a1, a2, b1 and b2.
- Oral exam to assess: a1, a2, b1, b2, d1 and d2.
- Activity to assess: d1 and d2.

Assessment schedule:

Assessment (1): Activity	Week 9
Assessment (2): Written exam	Week 15
Assessment (3): oral exam	Week 15

Weighting of Assessment:

Assessment method	Marks	Percentage
• Activity	10	10 %
• Written exam	75	75 %
• oral exam	15	15 %
TOTAL	**100**	**100%**

7- References and books:

A-Scientific papers

B- Essential books:

- Basic and clinical Pharmacology; 10th Edition, Kantzung B.G McGraw Hill Medical Publishing Division 2007.
- Drug-Induced Diseases: Prevention, Detection, and Management, 2nd Edition, Tisdale J. and Miller D. American Society of Health-System Pharmacists 2010.

Facilities required for teaching and learning:

1. **For lectures:** Black (white) boards, computer, data show.

- **Course Coordinators: Prof. Dr. Ahmed Fahmy**
- **Head of Department: Prof. Mona Fouad**

Matrix I of Drug Induced Disease course							
Week number	Course Contents	Knowledge and understanding		Intellectual skills		General & Transferable skills	
		a1	**a2**	**b1**	**b2**	**d1**	**d2**
1	Introduction to drug induced-diseases	X					
2	Drug-induced hepatotoxicity (Toxic response of the liver and mechanism of toxicity)	X					
3	Drug-induced hepatotoxicity (Diagnosis and management)	X			X		
4	Drug-induced nephrotoxicity (Toxic response of the kidney and mechanism of toxicity)	X			X		
5	Drug-induced nephrotoxicity (Diagnosis and management)	X					
6	Drug-induced CVS diseases (Toxic response of the heart and vascular system)		X	X			
7	Drug-induced CVS diseases (Mechanism of toxicity)		X	X			
8	Drug-induced CVS diseases (Diagnosis and treatment)		X	X			
9	Activity		X	X		x	X
10	Drug-induced CNS diseases (Structure and functions of brain blood barrier, toxic response of brain and spinal cord)		X	X			
11	Drug-induced CNS diseases (Mechanism of toxicity)		X	X			
12	Drug-induced CNS diseases (Diagnosis and treatment)		X	X			
13	Presentations	X	X	X	X		
14	Open discussion & revision	X	X	X	X	x	X

Matrix II of Drug Induced Disease

ARS		Program ILOs	Course ILOs	Course content	Source	Teaching and learning methods		Method of Assessment		
						Lectures	Self-learning	Written exam	Oral exam	Activity
Knowledge and Understanding	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A.1- Outline basic theories and principles of Physical Pharmacy,Biopharmaceutics and Pharmacokinetics, Pharmaceutical technology, Biostatistics, Biotechnology, drug induced diseases, Instrumental analysis, transdermal and controlled drug delivery as well as drug stability. A.2- Illustrate the essential information about different drug induced diseases and appropriate methods of treatment.	a1 a2	Introduction to drug-induced disease Drug-induced hepatotoxicity 1 Drug-induced nephrotoxicity 1 Drug-induced 1 CVS toxicity Drug-induced 1 CNS toxicity	Scientific papers, text books and Internet	X	X	X	X	
	2.2.5- Evaluate and manage risks and potential hazards in professional practices in the	B.5-Deal effectively with risks and hazards during professional and laboratory practice.	b1 b2	Drug-induced hepatotoxicity 2 Drug-induced nephrotoxicity 2 Drug-induced 3 CVS toxicity Drug-induced 3 CNS toxicity	Scientific papers, text books and Internet	X	X	X	X	

	area of specialization									
General & Transferable skills	2.4.1- Communicate effectively.	D.1- Communicate effectively with others.	d1	Activity	Scientific papers, text books and Internet	X	X		X	X
	2.4.4- Use variable sources to get information and knowledge.	D.4- Retrieve information from a variety of sources including libraries, databases and internet.	d2	Activity	Scientific papers, text books and Internet	X	X		X	X

Instrumental Analysis & ChromatographyII

Course specification of Instrumental Analysis & ChromatographyII

A- Course specifications:

- Program on which the course is given: Master's of Pharmaceutical Sciences
- Major or Minor element of program: Major
- Department offering the program: Pharmaceutics Dept
- Department offering the course: Analytical Chemistry.

- Date of specification approval: 2019
- **Basic information:**

Title: Instrumental Analysis Code: **M102**
Lectures: 4 hrs/week Credit hours: 4 hrs/ week
Total: 4 hrs/ week

2- Overall aim of the course:

On completion of the course, the students will be able to outline the basis and applications of instrumental analysis and describe theories, operation, pharmaceutical and biological applications of instrumental techniques.

3. Intended learning outcomes (ILOs):

A- Knowledge and Understanding	
a1	Outline the basis, theory and operation of different instrumental techniques of analysis.
a2	Describe different pharmaceutical and biological applications of instrumental techniques.
B- Intellectual skills	
b_1	Select the most appropriate instrumental technique in pharmaceutical and biological assay.
b_2	Integrate knowledge gained from different instrumental techniques in designing analytical system for analytes of complex nature
D- General and Transferable skills	
d_1	Acquire Computer skills like preparing presentations and collecting information through different data-bases.
d_2	Work effectively as a member of team
d_3	Demonstrate leadership capability

4. Course Contents:

Week No.	Content
1	**Instrumental Analysis:** *Introduction *Principles
2	**[Ultraviolet (UV)and Visible spectrophotometry** *Theory *Instrumentations
3	**[Infrared (IR) spectroscopy].** *Theory *Instrumentations
4	**Applications of UV and IR**
5	**Nuclear magnetic resonance (NMR).** *Theory **Instrumentations
6	**Mass-spectrometry (MS)** *Theory *Pharmaceutical and biological applications.
7	**Applications of NMR and MS**
8	**Electrochemistry** **Conductometry, Potentiometry.** *Theory *Pharmaceutical and biological applications.
9	**Chromatography:** *Introduction *Classification
10	**Quantitative and Qualitative Chromatographic techniques** *Basis *Pharmaceutical and biological applications
11	**HPLC** *Basis *Types Isocratic flow and gradient elution Particle size, Pore size, Pump pressure, detectors and applications
12	**Gas Chromatography** *Basis *Pharmaceutical and biological applications

	*Detectors
13	Student activities
14	Student activities
15	**final exam**

5- Teaching and Learning Methods:

- Lectures
- Self learning
- Student scientific presentation.
- Course assignments
- Internet based search
- Problem solving

6- Student Assessment methods:

Written exams to assess: a1, a2, b1, b2
Oral exam to assess: a1, a2, b1 and b2
Activity to assess: d1, d2 and d3

Assessment (1): Activity	Week 8
Assessment (2): Written exam	Week 15
Assessment (3): oral exam	Week 15

Weighting of Assessment:

Assessment method	Marks	Percentage
• Activity	10	10 %
• Written exam	75	75 %
• oral exam	15	15 %
TOTAL	**100**	**100%**

7- References and books:

A-Scientific papers
A-Scientific papers
B- Essential books:

- Modern Analytical Chemistry, David Harvey, McGraw-Hill Companies, first edition, 2002.
- Principles of Instrumental Analysis, Douglas A. Skoog, F. James Holler, Crouch Thomson Brooks/Cole, 2007
- Handbook of instrumental techniques of analytical chemistry, Frank A. Settle, Prentice Hall PTR, 1997.

C- Suggested books:

- British Pharmacopoeia, HM Stationery Office, London, UK, PA, 2007,
- Martindale: The Complete Drug Reference, Pharmaceutical Press; 35 edition (2007) **.**

Websites and journals:

- www.rsc.org
- www.sciencedirect.com
- www.pubmed.com
- www.medline.com
- Guidance for Industry: Q2B of Analytical Procedures; Methodololgy: International Conference of Harmonization (ICH). Nov. 1996 (http:/ www.fda.gov/eder/guidance /1320fnl.pdf).
- Journal of Chromatography A and B, Separation sciences, Analytical and Bioanalytical Chemistry, Bioanalysis, Analytical letters.

Facilities required for teaching and learning:

For lectures: Black (white) boards, data show.

Course Coordinators: Prof Dr/ Hisham Ezzat

Head of Department: Prof Dr/ Magda ElHenawi

Matrix I of Instrumental Analysis & ChromatographyII								
Course Contents		ILOs						
		Knowledge and understanding		Intellectual skills		General and Transferable skills		
		a1	a2	b1	b2	d_1	d_2	d_3
1	**Instrumental Analysis:** *Introduction *Principles	X						
2	**[Ultraviolet (UV)and Visible spectrophotometry** *Theory *Instrumentations	X	x	x				
3	**[Infrared (IR) spectroscopy].** *Theory *Instrumentations	X	x	x				
4	**Applications of UV and IR**	X	x	x				
5	**Nuclear magnetic resonance (NMR).** *Theory **Instrumentations	X	x	x				
6	**Mass-spectrometry (MS)** *Theory *Pharmaceutical and biological applications.	X	x	x				
7	**Applications of NMR and MS**	X	x	x				
8	**Electrochemistry Conductometry, Potentiometry.** *Theory *Pharmaceutical and biological applications.	X	x	x				
9	**Chromatography:** *Introduction *Classification	X						
10	**Quantitative and Qualitative Chromatographic techniques**	X	x	x				

	*Basis *Pharmaceutical and biological applications							
11	**HPLC** *Basis *Types Isocratic flow and gradient elution Particle size, Pore size, Pump pressure, detectors and applications	x						
12	**Gas Chromatography** *Basis *Pharmaceutical and biological applications * Detectors	x						
13	Student activities			x	x	x	x	x
14	Student activities			x	x	x	x	x

Matrix II of Instrumental Analysis & Chromatography II										
ARS		Program ILOs	Course ILOs	Course contents	Source	Teaching and learning methods		Method of assessment		
						Lecture	Self learning	Written exam	Oral Exam	Activity
Knowledge and Understanding	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A.1- Outline basic theories and principles of Physical Pharmacy,Biopharmaceutics and Pharmacokinetics, Pharmaceutical technology, Biostatistics, Biotechnology, drug induced diseases, Instrumental analysis, transdermal and controlled drug delivery as well as drug stability.	a1	Instrumental Analysis--UV-visible spectrophotometry, Fluorometry--IR---NMR--Conductometry, Potentiometry--MS-------chromatography	Textbooks, Scientific papers and self learning	x	x	X	x	

	2.1.5- Principles and the basics of quality in professional practice in the area of specialization.	A.6 - Outline basic principles of instrumental analysis, operation as well as applications of instrumental techniques	a2	---HPLC, GC, applications						
	2.2.3-Correlate and integrate different pharmaceutical knowledge to solve professional problems.	B.3- Plan to solve possible problems based on the integration of required pharmaceutical knowledge.	b1-b2	Instrumental Analysis-- UV-visible spectrophotometry, Fluorometry--IR--- NMR-- Conductometry, Potentiometry--MS---chromatography---HPLC, GC, applications	Textbooks, Scientific papers and self learning	x	x	X	x	
General and Transferable Skills	2.4.2- Effectively use information technology in professional practices	D.2- Acquire computer skills in analyzing results and presenting them.	d1	Activity	Textbook ,Scientific papers and self learning		x			x

	2.4.6- Work in a team and lead teams carrying out various professional tasks.	D.6- Work effectively as a member or leader of a team.	d2	Activity	Textbook Scientific papers and self learning		x			x

Biotechnology

Course Specification of Biotechnology

A- Course specifications:

- **Program on which the course is given:** Master of Pharmaceutical Sciences
- **Major or minor element of programs:** Major
- **Department offering the program:** Pharmaceutics
- **Department offering the course:** Microbiology and Immunology department in conjunction with Biochemistry department
- **Date of specification approval:** 2019

1-Basic Information:

Title: Biotechnology Code:ME4

Credit hours: 4hrs/week Lectures: 4hrs/week

Total: 4hrs/week

2- Overall aims of the course:

On completion of the course, the student will be able to describe the components of biotechnology, the exploitation of gene cloning and recombinant DNA technology in production of useful microbial industrial strains and in monoclonal antibody technology, apply conventional genetic approaches and molecular genetics approaches in biotechnology, explain the bases of molecular genetics, and basic gene cloning strategies and tools and explore the basis of stem cell biotechnology and the regenerative medicine.

3-Intended learning outcomes (ILOS) of Biotechnology:

A- Knowledge and Understanding	
1a	Outline the principles of biotechnology techniques
2a	Explain how to manage and exploit knowledge of DNA cloning, recombinant DNA, and applied technology
3a	Summarize recent medical biotechnology applications.
a4	Identify the principles of stem cell biotechnology and regenerative medicine
B- Intellectual skills	
b1	Express the principles biotechnology in medicine, agriculture and pollution control.
b2	Relate the principles of recombinant DNA technology in gene cloning and assessment of the microbial transformation
b3	Discuss the principles of PCR technology in the assessment of microbial mutation, gene detection, gene sequencing & forensic medicine
D- General and transferable skills	
d1	Develop computer skills as internet and power point in the activities.
d2	Gain information from various sources as text books, scientific journals, internet,…etc.
d3	Work effectively as a team member

4-Course content of Biotechnology:

Week No.	Lecture content (2 hrs/week) (Microbiology Department)	Lecture content (2 hrs/week) (Biochemistry Department)
1	Introduction to biotechnology	Pharmacokinetics and pharmacodynamics of peptides and protein drugs a- Elimination of protein therapeutics b- Distribution of protein therapeutics
2	DNA Recombination: • Naturally occurring genetic recombination • Artificially occurring genetic recombination (in laboratory)	Pharmacokinetics and pharmacodynamics of peptides and protein Drugs c- Protein binding of protein d- Chemical modification of protein therapeutics
3	Requirements for genetic engineering	Hematopoietic Growth Factor a- Chemical description b- Pharmaceutical concerns c- Clinical and practice aspects d- Toxicities
4	Gene Cloning: • General strategy for gene cloning • Obtaining the target genes	INTERLEUKINS a- Interleukins 1-17 b- Introduction and chemical Description – Pharmacology
5	Gene Cloning: • Finding suitable cloning vectors • Joining target gene(s) to vector • Insertion of hybrid (recombinant) DNA into expression host	INTERLEUKINS c- Interferon's alpha , Beta , Gamma d- Pharmaceutical concerns e- Clinical and Practice aspects

	(transformation) and selection of transformant	
6	Applications of genetic engineering **Activity**	INSULIN a- Introduction b- Pharmacology and Formulations c- Pharmaceutical concerns, chemical and physical stabilities d- Clinical and practice aspects **Activity**
7	Polymerase chain reaction (PCR) Types of PCR • Traditional PCR • rt PCR • Real time PCR	Growth hormones a- hGH structure , Isolation b- Pharmacology
8	Applications of PCR: 1- gene amplification for: • gene cloning • gene sequencing • gene control drug production 2- diagnosis of microbial infections 3- in forensic medicine	Growth hormones c- Protein manufacture , formulations d- Clinical use
9	Monoclonal antibody (MAb) technology (synthesis of Ab in laboratory): • hybridoma technology • production & selection of Ab • types of genetically engineered MAb (mouse,	Dispensing Biotechnology products a- Introduction – Storage b- Handling c- Preparations

	chemeric, humanized, human) • nomenclature of MAb according to the target and source • Global Marketing pharmaceutically useful MAb	
10	Stem cells technology: • Types of stem cells • Isolation • Culturing • Applications of stem cells in regenerative medicine	Dispensing Biotechnology products d- Administration e- Outpatient/Homecare use f- Patient assessment
11	Advances in vaccine preparation	Biotechnology for pharmaceutical products a- Hormones b- Preparation of vaccines and other biological products
12	Gene sequencing	Biotechnology for pharmaceutical products c- Old , modern Biotechnology d- Applications in Medicine- industry – Agriculture – Ecology
13	Microarray technology	PCR , LCR ,applications in forensic medicine- Mutations- RFLP…..etc
14	Presentation of students activities and open discussion	
15	Final exam	

5-Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion and presentations

- Critical thinking

6-Student Assessment methods:

- Written exams to assess: a1, a2, a3, a4, b1, b2, b3
- Oral exam to assess: a1, a2, a3, a4, b1, b2, b3
- Activity to assess: d1, d2, d3

Assessment schedule:

Assessment (1): Activity	Week 6,14
Assessment (2): Written exam	Week 15
Assessment (3): oral exam	Week 15

Weighting of Assessment:

Assessment method	Marks	Percentage
• Activity	10	10 %
• Written exam	75	75 %
• oral exam	15	15 %
TOTAL	**100**	**100%**

7-References &books:

A- Scientific papers

B- Essential books:

1. Crommelin, D.A.; and Sindeler, R.D. (1997). Pharmaceutical Biotechnology. Hartwood Academic Publishers. The Netherlands.
2. Glick, B.P.; and Pasterternak, J.J. (1994). Molecular Biotechnology-Principles Applications of recombinant DNA. AS Press, Washington, D.C., USA.

3. Thieman, W.J.; Palladino, M.A. (2008). *Introduction to Biotechnology*. Pearson/Benjamin Cummings. ISBN 0-321-49145-9.
4. Higuchi, R., Dollinger, G., Walsh, P.S. & Griffith, R. (1992) Simultaneous amplification and detection of specific DNA sequences. *Biotechnology*, 10, 413–417. [The first description of real-time PCR].
5. VanGuilder, H.D., Vrana, K.E. & Freeman, W.M. (2008) Twenty-five years of quantitative PCR for gene expression analysis. *Biotechniques*, 44, 619–624.

C- Suggested books:

1. Biotechnology in health care: an introduction to biopharmaceuticals
2. Ermak G., (2013), Modern Science & Future Medicine (second edition)

D- Websites: pubmed, Science direct, Nejm, Weilyinterscience

Facilities required for teaching and learning:

1. **For lectures:** Black (white) boards, computer, data show.

- **Course Coordinators: Prof. Dr/ Ashraf Ahmed Kadry**
  Prof. Dr/ Mohammed El-Sewedy
- **Head of Department: Prof. Dr/ Nehal El-sayed**

Matrix I of Biotechnology (2019)

	Course Contents	ILOs of Biotechnology course									
		Knowledge and Understanding				Intellectual skills			General and transferable skills		
		a1	a2	a3	a4	b1	b2	b3	d1	d2	d3
1	Introduction to biotechnology	x									
2	Bioprocess	x									
3	Downstream processing	x									
4	Cell culture - Activity	x				x	x	x			
5	Hybridoma technology	x									
6	Medical biotechnology			x	x						
7	Medicine from cultured cells			x	x						
8	DNA Recombination & Application of genetic engineering		x	x	x						
9	Principle of PCR technology and gene amplification.	x	x				x	x			
10	Applications and advances in PCR			x	x		x	x			
11	Hybridoma technology& Monoclonal antibody(MAb)-technology & Production Nomenclature of MAbs				x						
12	Global Marketing Pharmaceutically useful monoclonal antibodies			x	x						
13	Applications and advances in PCR			x	x		x	x			
14	• Vaccine preparations • Stem cells technology & • Regenerative medicine. • **Activity** (presentation)			x	x	x	x	x	X	x	x

Matrix II of Biotechnology

ARS		Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods		Method of assessment		
						Lecture	Self learning	Written exam	oral exam	Activity
Knowledge and Understanding	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A.1- Outline basic theories and principles of Physical Pharmacy,Biopharmaceutics and Pharmacokinetics, Pharmaceutical technology, Biostatistics, Biotechnology, drug induced diseases, Instrumental analysis, transdermal and controlled drug delivery as well as drug stability.	a1- a2- a3-a4	Introduction to biotechnology- Bioprocess- Downstream processing- Cell culture- Hybridoma technology-Medical biotechnology- Medicine from cultured cells- DNA Recombination & Application of genetic engineering - Principle of PCR technology and gene amplification.- Applications and advances in PCR- Hybridoma technology& Monoclonal antibody(MAb)- technology & Production Nomenclature of Mabs- Global Marketing Pharmaceutically useful monoclonal antibodies - Applications and advances in PCR -Vaccine preparations- Stem cells technology & Regenerative medicine.	Textbooks, Scientific papers and self learning	x	x	x	x	
		A.3- Describe the basics for genetic engineering and principal and applications of PCR technology.			Textbooks, Scientific papers and self learning	x	x	x	x	

	2.2.1- Analyze and evaluate information in the field of specialization and analogies to solve problems	B.1- Analyze and evaluate the information gained in the field of pharmaceutics to solve different drug formulation problems.	b1-b2-b3	Medical biotechnology- Medicine from cultured cells- DNA Recombination & Application of genetic engineering - Applications and advances in PCR- Hybridoma technology& Monoclonal antibody(MAb)- technology & Production Nomenclature of Mabs- Global Marketing Pharmaceutically useful monoclonal antibodies - Applications and advances in PCR -Vaccine preparations- Stem cells technology & Regenerative medicine.	Textbooks, Scientific papers and self learning	x	X	x	x	
	2.4.2- Effectively use information technology in professional practices	D.2- Acquire computer skills in analyzing results and presenting them.	d1	Activity - presentation of reports and open discussion	Textbooks, Scientific papers and self learning	x	X			x
	2.4.4- Use variable sources to get information and knowledge.	D.4- Retrieve information from a variety of sources including libraries,	d2	Activity - presentation of reports and open discussion						

		databases and internet.									
	2.4.6- Work in a team and lead teams carrying out various professional tasks.	D.6- Work effectively as a member or leader of a team.	d3	Activity - presentation of reports and open discussion		x	X		x	x

Special courses

Controlled Release Dosage Forms

Course specification of Controlled release dosage forms

A- Course specifications:

- **Program on which the course is given:** Master of Pharmaceutical Sciences
- **Major or Minor element of program:** Major
- **Department offering the program:** Pharmaceutics Dept.
- **Department offering the course:** Pharmaceutics Dept.
- **Date of specification approval:** 2019

1- Basic information:

Title: **Controlled-release dosage forms** Code: Esp1
Lectures: 4 hrs/week Credit hours: 4 hrs/week
Total: 4 hrs/week

2- Overall aim of the course:

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

- Illustrate the principles of design and formulation of controlled-release dosage forms as well as properties and mechanisms.

3- Intended learning outcome s (ILOs) of Controlled-release dosage forms:

Knowledge and Understanding	
a1	Enumerate different controlled-release drug delivery systems
a2	Illustrate the properties and formulation principles of different controlled-release drug delivery systems
a3	Describe different mechanisms of drug release from controlled drug delivery systems
Intellectual skills	
b1	Select the proper controlled release drug delivery system for optimal drug effect
General and Transferable skills	
d1	Retrieve information from a variety of sources
d2	Develop self learning skills

4. Course Content of Controlled-release dosage forms (Master degree):

Week number	Lecture content (4 hr/w)
1	• General design principle for controlled-release drug delivery systems
2	• Physicochemical factors influencing design and performance of controlled-release formulations
3	• Biological factors influencing design and performance of controlled-release formulations
4	• Controlled-release oral dosage forms
5	• Diffusion, dissolution and osmotic controlled drug delivery systems
6	• Microencapsulation
7	• Nanostructure-mediated controlled-release dosage forms

	(Presentation)
8	• Liposomes
9	• Niosomes
10	• Technologies for developing transdermal dosage forms
11	• Ocular controlled-release dosage forms
12	• Vaginal and uterine controlled-release dosage forms
13	• Release of drugs from time-controlled-release dosage forms
14	• Release of drugs from stimuli-induced controlled-release systems **(Final Presentation)**
15	• Final exam

5- Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion

6- Student Assessment methods:

Written exams to assess: a1, a2, a3, b1
Oral exam to assess: a1, a2, a3, b1
Activities to assess: d1, d2

Assessment method	Time	Marks	Percentage
Written exam	Week 15	75	75%
Oral exams	Week 15	15	15%
Activities	Week 7, 14	10	10%
Total	------	100	100%

7- References and books:

A- Essential books:

Colloidal drug delivery systems Jörg Kreuter, M. Dekker, 1994 – 353.

Vincent H. L. Lee, Joseph R. Robinson, Controlled Drug Delivery, Taylor & Francis, 1987.

B- Suggested books: Martin's physical pharmacy and pharmaceutical

sciences: Patrick J. Sinko, Alfred N. Martin, Lippincott Williams & Wilkins, (2006).

C- Websites: Pubmed, Sciencedirect, Weilyinterscience

Facilities required for teaching and learning:

1. **For lectures:** Black (white) boards, Computer, data show.

- **Course Coordinators: Assist.Prof.Dr/ Azza Ali Hasan**
- **Head of Department: Prof Dr/Nagia Ahmed El-Megrab**
- **Date: 2019-9-23 تم اعتماد التوصيف بمجلس الكلية بتـاريخ**

Matrix I of Controlled release dosage forms

	Course Contents	ILOs of Controlled release dosage forms					
		Knowledge and understanding			Intellectual skills	Transferable and general skills	
		a1	a2	a3	b1	d1	d2
1	General design principle for controlled-release drug delivery systems	x	x	x			
2	Physicochemical factors influencing design and performance of controlled-release formulations		x				
3	Biological factors influencing design and performance of controlled-release formulations		x				
4	Controlled-release oral dosage forms	x	x	x			
5	Diffusion, dissolution and osmotic controlled drug delivery systems	x	x	x	x		
6	Microencapsulation		x	x			
7	Nanostructure-mediated controlled-release dosage forms Presentation	x	x	x		x	X
8	Liposomes		x	x			
9	Niosomes		x	x			
10	Technologies for developing transdermal dosage forms		x	x			
11	Ocular controlled-release dosage forms	x	x	x			
12	Vaginal and uterine controlled-release dosage forms	x	x	x			
13	Release of drugs from time-controlled-release dosage forms		x				
14	Release of drugs from stimuli-induced controlled-release systems		x			x	x

Matrix II of Controlled release dosage forms										
ARS		**Program ILOs**	**Course ILOs**	**Course contents**	**Sources**	**Teaching and learning methods**		**Method of assessment**		
						Lecture	Self learning	Written exam	Oral exam	Activity
2.1	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A.1- Outline basic theories and principles of Physical Pharmacy,Biopharmaceutics and Pharmacokinetics, Pharmaceutical technology, Biostatistics, Biotechnology, drug induced diseases, Instrumental analysis, transdermal and controlled drug delivery as well as drug stability.	a2 a3	General design principle for controlled-release drug delivery systems,Liposomes,niosomes, Ocular controlled-release dosage forms Physicochemical factors influencing design and performance of controlled-release formulations Biological factors influencing design and performance of controlled-release formulations Technologies for developing transdermal dosage forms	Textbooks, Scientific papers and self learning	x	x	x	x	

	2.1.3- Scientific developments in the area of specialization.	A.8 – Illustrate different types of transdermal and controlled drug delivery systems, their formulation and therapeutic uses	a1	Release of drugs from time-controlled-release dosage forms Release of drugs from stimuli-induced controlled-release systems Nanostructure-mediated controlled-release dosage forms Niosomes Liposomes	Textbooks, Scientific papers and self learning	x	x	x	x	
	2.2.2- Solve specified problems in the lack or missing of some information.	B.2- Suggest proper and logic solutions to the research problems using the available information.	b1	Diffusion, dissolution and osmotic controlled drug delivery systems	Textbooks, Scientific papers and self learning	x	x	x		
2.4	2.4.4- Use variable sources to get information and knowledge.	D.4- Retrieve information from a variety of sources including libraries, databases and internet.	d1	Activity	Textbooks, Scientific papers and self learning		x			**x**
	2.4.8- Continuous and self learning	D.8- Develop continuous learning skills to improve the career.	d2	Activity	Textbooks, Scientific papers and self learning		x			**x**

Drug Stability

Course specification of Drug stability

A- Course specifications:

- **Program on which the course is given:** Master of Pharmaceutical Sciences
- **Major or Minor element of program:** Major
- **Department offering the program:** Pharmaceutics Dept.
- **Department offering the course:** Pharmaceutics Dept.
- **Date of specification approval:** 2019

1- Basic information:

Title: **Drug stability** Code: Esp2
Lectures: 4 hrs/week Credit hours: 4 hrs/week
Total: 4 hrs/week

2- Overall aim of the course:

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

- Describe different pathways of drugs degradation and methods to determine the order of reaction as well as stability programs for pharmaceutical products and the latest regulations for stability testing.

3- Intended learning outcome s (ILOs) of Drug stability:

Knowledge and Understanding	
a1	Illustrate different orders of reactions and methods of determination of order of reactions
a2	Explain the principles of physical and chemical degradation of drugs in different dosage forms
a3	Describe stability testing of different dosage forms
Intellectual skills	
b1	Identify factors affecting drug stability
b2	Propose management strategies to overcome stability problems
General and transferable skills	
d1	Communicate effectively with others
d2	Acquire computer skills

4. Course Content of Drug stability (Master degree):

Week number	Lecture content (4 hr/w)
1	• Rate of chemical reactions
2	• Orders of reactions • Zero order
3	• First order
4	• Second order
5	• Apparent zero order reaction • Pseudo first order reaction
6	• Determination of order of reaction • Substitution method
7	• Graphical method **(Presentation)**
8	• Half-life method
9	• Routes of degradation • Hydrolysis • Oxidation
10	• Photochemical degradation • Incompatibility
11	• Physical degradation routes

	• Vaporization • Aging • Adsorption
12	• Complex reactions
13	• Stability testing
14	• Revision **(Final Presentation)**

5- Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion

6- Student Assessment methods:

Written exams to assess: a1, a2, a3, b1, b2
Oral exam to assess: a1, a2, a3, b1, b2
Activities to assess: d1, d2

Assessment method	Time	Marks	Percentage
Written exam	Week 15	75	75%
Oral exams	Week 15	15	15%
Activities	Week 7, 14	10	10%
Total		100	100%

7- References and books:

A- Essential books: Drug Stability: Principles and Practices (Drugs and the Pharmaceutical Sciences) by Jens T. Carstensen and Christopher Rhodes (2000).
B- Suggested books: Handbook of Stability Testing in Pharmaceutical Development: Regulations, Methodologies, and Best Practices, Kim Huynh-Ba, 389 (2008).
C- Websites: Pubmed, Sciencedirect, Weilyinterscience

Facilities required for teaching and learning:

1. **For lectures:** Black (white) boards, data show.

- **Course Coordinators: Prof.Dr/ Hanaa Abd El-Fattah El-Ghamry**
- **Head of Department: Prof Dr/ Nagia Ahmed El-Megrab**
- **Date: تم اعتماد التوصيف بمجلس الكلية بتـاريخ 2019-9-23**

Matrix I of Drug Stability								
Course Contents		ILOs of drug stability course						
		Knowledge and understanding			Intellectual skills		Transferable and general skills	
		a1	a2	a3	b1	b2	d1	d2
1	Rate of chemical reactions	x						
2	Zero order	x						
3	First order	x						
4	Second order	x						
5	Apparent zero order reaction Pseudo first order reaction	x						
6	Determination of order of reaction -Substitution method	x						
7	Graphical method Presentation	x					X	x
8	Half-life method	x						
9	Routes of degradation -Hydrolysis -Oxidation		x		x	X		
10	Photochemical degradation -Incompatibility		x		x	X		
11	Physical degradation routes -Vaporization -Aging - adsorption		x		x	X		
12	Complex reactions		x		x	x		
13	Stability testing			x				
14	Open discussion Presentation	x	x	x	x	X	X	x

Matrix II of Drug stability

ARS		Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods		Method of assessment		
						Lecture	Self learning	Written exam	Oral Exam	Activity
2.1	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A.1- Outline basic theories and principles of Physical Pharmacy,Biopharmaceutics and Pharmacokinetics, Pharmaceutical technology, Biostatistics, Biotechnology, drug induced diseases, Instrumental analysis, transdermal and controlled drug delivery as well as drug stability.	a1	Rate of chemical reactions Zero order First order Second order Apparent zero order reaction Pseudo first order reaction Determination of order of reaction -Substitution method Graphical method Half-life method	Textbooks, Scientific papers and self learning	x	x	x	x	

	2.1.5- Principles and the basics of quality in professional practice in the area of specialization.	A.7 - Identify different factors affecting drug stability, regulations for stability testing and shelf-life determination	a2	Routes of degradation -Hydrolysis -Oxidation Photochemical degradation -Incompatibility Physical degradation routes -Vaporization -Aging - adsorption Complex reactions	Textbooks, Scientific papers and self learning	x	x	x	x	
			a3	Stability testing Complex reactions	Textbooks, Scientific papers and self learning	x	x	x	x	
2.2	2.2.5- Evaluate and manage risks and potential hazards in professional practices in the area of specialization	B.5-Deal effectively with risks and hazards during professional and laboratory practice.	b1 b2	Stability testing Routes of degradation -Hydrolysis -Oxidation Photochemical degradation -Incompatibility Physical degradation routes -Vaporization -Aging - adsorption	Textbooks, Scientific papers and self learning	x	X	x	x	
	2.4.1- Communicate effectively	D.1- Communicate effectively with others	d1							

2.4	2.4.2- Effectively use information technology in professional practices	D.2- Acquire computer skills in analyzing results and presenting them.	d2	Activity	Textbooks , Scientific papers and self learning		x			**x**

Transdermal Drug Delivery System

Course specification of Transdermal drug delivery systems

A- Course specifications:

- **Program on which the course is given:** Master of Pharmaceutical Sciences
- **Major or Minor element of program:** Major
- **Department offering the program:** Pharmaceutics Dept.
- **Department offering the course:** Pharmaceutics Dept.
- **Date of specification approval:** 2019

1- Basic information:

Title: **Transdermal drug delivery systems** Code: Esp3
Lectures: 4 hrs/week Credit hours: 4 hrs/week
Total: 4 hrs/week

2- Overall aim of the course:

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

- Describe different types of transdermal drug delivery systems and their therapeutic uses.

3- Intended learning outcome s (ILOs) of Transdermal drug delivery systems:

Knowledge and Understanding	
a1	Describe the basic considerations of transdermal drug delivery systems and their therapeutic uses
a2	Outline the formulation of different transdermal drug delivery systems.
a3	Ensure quality of transdermal drug delivery systems.
Intellectual skills	
b1	Suggest the proper transdermal drug delivery system for optimal drug use
General and transferable skills	

d1	Develop self learning skills

4. Course Content of Transdermal drug delivery (Master degree):

Week number	Lecture content (4 hr/w)
1	• Skin • Advantages and disadvantages of transdermal drug delivery system
2	• Kinetics of transdermal permeation
3	• Basic components of transdermal drug delivery system
4	• Factors affecting transdermal bioavailability
5	• Various methods for preparation of transdermal drug delivery system
6	• Types of transdermal patches
7	• Mechanism of action of transdermal patches **(Presentation)**
8	• Evaluation parameters
9	• Transdermal market
10	• Advance developments in transdermal drug delivery system
11	• Formulation of semisolid dosage forms(Ointments) and equipments used
12	• Formulation of semisolid dosage forms(Creams) and equipments used
13	• Formulation of semisolid dosage forms(Gels) and equipments used
14	• Formulation of semisolid dosage forms (Pastes) • **(Final Presentation)**

5- Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion

6- Student Assessment methods:

Written exams to assess: a1, a2, a3, b1
Oral exam to assess: a1, a2, a3, b1
Activities to assess: d1

Assessment method	Time	Marks	Percentage
Written exam	Week 15	75	75%
Oral exams	Week 15	15	15%
Activities	Week 7, 14	10	10%
Total	------	100	100%

7- References and books:

A- Essential books: Aulton's Pharmaceutics: The Design and Manufacture of Medicines. Aulton, M. E., Taylor, K. (2002)

B- Suggested books: Transdermal and Topical Drug Delivery Systems. Ghosh T. K., Pfister W., Su Il Yum (1997).

C- Websites: Pubmed, Sciencedirect, Nejm, Weilyinterscience

Facilities required for teaching and learning:

1. **For lectures:** Black (white) boards, computers, data show.

- **Course Coordinators: Assist.Prof.Dr/ Azza Ali Hasan**
- **Head of Department: Prof. Dr/ Nagia Ahmed El- Megrab**
- **Date:** **2019-9-23 تم اعتماد التوصيف بمجلس الكلية بتاريخ**

Matrix I of Transdermal drug delivery systems

Course Contents		ILOs of Transdermal drug delivery systems course				
		Knowledge and understanding			Intellectual skills	Transferable and general skills
		a1	a2	a3	b1	d1
1	Skin Advantages and disadvantages of transdermal drug delivery system	x				
2	Kinetics of transdermal permeation	x				
3	Basic components of transdermal drug delivery system		x		X	
4	Factors affecting transdermal bioavailability	x				
5	Various methods for preparation of transdermal drug delivery system		x		X	
6	Types of transdermal patches	x				
7	Mechanism of action of transdermal patches Presentation	x				X
8	Evaluation parameters			X		
9	Transdermal market			X		
10	Advance developments in transdermal drug delivery system			X		
11	Formulation of semisolid dosage forms(Ointments) and equipments used		x		X	
12	Formulation of semisolid dosage forms(Creams) and equipments used		x		X	
13	Formulation of semisolid dosage forms(Gels) and equipments used		x		X	
14	Formulation of semisolid dosage forms(Pastes)		x		X	

Matrix II of Transdermal drug delivery systems										
ARS		**Program ILOs**	**Course ILOs**	**Course contents**	**Sources**	**Teaching and learning methods**		**Method of assessment**		
						Lecture	Self learning	Written exam	Oral exam	Activity
2.1	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A.1- Outline basic theories and principles of Physical Pharmacy,Biopharmaceutics and Pharmacokinetics, Pharmaceutical technology, Biostatistics, Biotechnology, drug induced diseases, Instrumental analysis, transdermal and controlled drug delivery as well as drug stability.	a1 a3	Skin Advantages and disadvantages of transdermal drug delivery system Kinetics of transdermal permeation - Basic components of transdermal drug delivery system Factors affecting transdermal bioavailability Types of transdermal patches Mechanism of action of transdermal patches	Textbooks, Scientific papers and self learning	X	X	x	x	

	2.1.3- Scientific developments in the area of specialization.	A.8 – Illustrate different types of transdermal and controlled drug delivery systems, their formulation and therapeutic uses	a2	Transdermal market Advance developments in transdermal drug delivery system	Textbooks, Scientific papers and self learning	X	X	x	x	
2.2	2.2.1- Analyze and evaluate information in the field of specialization and analogies to solve problems	B.1- Analyze and evaluate the information gained in the field of pharmaceutics to solve different drug formulation problems.	b1	Basic components of transdermal drug delivery systems Various methods for preparation of transdermal drug delivery system - Formulation of semisolid dosage forms and equipments used |(Ointments, creams, gels, pastes)	Textbooks, Scientific papers and self learning	X	X	x		
2.4	2.4.3- Self-assessment and define his personal learning needs	D.3-Show self assessment and plan to cover the needs.	d1	Activity	Textbooks, Scientific papers and self learning		x			**x**

Thesis Specification

Master Thesis in Pharmaceutics

Course specifications:

- **Program on which the thesis is done:** Master of Pharmaceutical sciences (Pharmaceutics)
- **Major or Minor element of program:** Major
- **Department offering the program:** Pharmaceutics Dept.
- **Department offering the thesis:** Pharmaceutics Dept.
- **Date of specification approval:** 2019

1- Basic information:

Title: **Master of Pharmaceutical sciences (pharmaceutics)**
Credit hours: 30hrs

2- Overall aim of the thesis:

On completion of the thesis, the students will be able to outline the possible protocol for solving harsh problem that the candidate can work after integrating suitable knowledge about this point of research, to identify and perform different techniques and methods used in the experimental work according to the designed protocol, to derive and present the results of the study from the data collected and to draw conclusions about the contribution to knowledge made by the study which may be concerned with the problem under investigation, the methods deployed or the student as researcher

3- Intended learning outcome's (ILOs):	
Knowledge and Understanding	
a1	Outline theoretical and advanced bases of pharmaceutics
a2	Demonstrate the importance of knowledge of modern techniques used during working in the area of specialization of research
a3	Define the up to date professional and academic practices
a4	Demonstrate the legal aspects during professional and academic practices
a5	Illustrate the importance of quality assurance during the formulation of different dosage forms
a6	Identify and apply scientific experimental ethics.
Intellectual skills	
b1	Solve problems related to practical work by obtained quantitative data from the practical work
b2	Discuss professional problems and suggest solutions rely on different pharmaceutical knowledge and recent information
b3	Plan a research in the field of drug delivery or targeting that allow discovery of modern and efficient techniques for drug targeting
b4	Manage risks and hazards related to professional practical area
b5	Outline principles that should be followed in research to develop laboratory performance
b6	Decide what to do with full responsibility in scientific research
Professional and practical skills	
c1	Apply different techniques related to practical thesis work.
c2	Use and evaluate practical data to write report
c3	Estimate laboratory techniques used in pharmaceutics and industrial pharmacy labs
General and Transferable skills	
d1	Interact with health care professional.
d2	Use information technology in review and thesis preparation
d3	Study independently and evaluate learning needs in pharmaceutics

d4	Reprocess up-to-date information in different areas under study and research
d5	Implement tasks as a member of a team.
d6	Set rules for evaluation and judging others performance.
d7	Acquire time management skills

4. Thesis Content:

Steps	Content
1st	Suggest the possible points/ problems of research that the candidate can work on in the frame of the aim of work and choose proper point. Collect all available information about this subject by all possible means. Use internet, journals, books and others thesis to get previous and recent information about the subject under study. Design the protocol including the steps of work following the suitable timetable. Increase the awareness of the recent pharmaceutical techniques that will be used during practical work and determined by the protocol. Integrate different knowledge (Pharmaceutics, industrial pharmacy, GMP, Hospital pharmacy, incompatibilities ……..) to solve suggested problem. Continuous evaluation to the thesis outcome according to the schedule.
2nd	Identify different practical techniques and methods to assess pharmacokinetic parameters related to the subject under study. Perform various techniques to improve physical and chemical characters of drugs under research

	Formulate many classes of drugs in new dosage forms (suppositories, capsules, tablets, …….) Operate scientific instruments according to instructions. Evaluate and manage hazards (chemical and biological) throughout the whole practical work. Organize the experimental work according to the designed protocol (either individual, parallel or sequential experiments). Induction of some diseases in experimental animals (Hypertension, inflammation, seizures…….). Separate biological samples (e.g. blood, plasma). Apply ethical recommendations during dealing with experimental animals
3rd	Collect raw data for the tested pharmacokinetic parameters. Interpret raw data to get valuable information. Perform statistical analysis for the results. Present and describe the results graphically. Suggest solution to the problem understudy based on this presented data.
4th	Communicate with supervisors to discuss results Work effectively as a member of a team (e.g. Supervisors, various professionals and Technicians). Present the results periodically in seminars. Define ethics of scientific research. Write scientific reports on the obtained results with conclusive significance.

	Discuss obtained results in comparison with pervious literatures. Suggest possible recommendations based on the outcome of the thesis and decide future plans. Summarize the thesis in an understandable Arabic language for non professionals. Write references in the required form (Thesis, Paper…….). Demonstrate the thesis in a final power point presentation. Continue self-learning throughout the experimental work and writing scientific papers.

5- Teaching and Learning Methods:

- Self learning (Activities, Research….)
- Lab work
- Seminar
- reporting
- Critical thinking
- Solving problem
- Open discussion

6- References:

- Websites: Pubmed, Sciencedirect, Weilyinterscience

Facilities required for:

1. **For practical work:** U.V spectrophotometer, centrifuge, Dissolution, Vortex, HPLC, Analytical balance (4digit), Thermostatic water bath, Vacuum Oven

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- **Head of Department: Prof Dr/ Nagia Ahmed El-Megrab**

Program Matrix of Master degree of Pharmaceutics

		Program ILOs																									
		Knowledge and Understanding									Intellectual skills							Professional & practical skills			General and Transferable skills							
		A1	A2	A3	A4	A5	A6	A7	A8	A9	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	D1	D2	D3	D4	D5	D6	D7	D8
General courses	Physical Pharmacy	x			X				x				x									X				x		
	Biopharmaceutics & Pharmacokinetics	x			x								x									X		X				
	Pharmaceutical technology	x					X		x				X									X		X		X		
	Biostatistics	X									X										x	X						
	Instrumental analysis	x					x						X									X				X		
	Biotechnology	x		X							x											X		X		X		
	Applied Pharmacology		X										X				X						X					
	Drug induced diseases	X	X												x						x			X				
Special courses	Controlled release dosage forms	x							x			x										X		X				x
	Drug stability	x						X						x								X	x					
	Transdermal drug delivery systems	x							x		x												x					
Thesis		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

PhD Degree

Program Specification

Program Specification

A- Basic Information

1- Program title: PhD. Pharm. Sci Degree in **Pharmaceutics**

2- Program type: Single.

3- Faculty/ University: Faculty of Pharmacy, Zagazig University

4- Department: Pharmaceutics

5- Coordinator: Prof. Dr. Fakhar El-Deen Ghazy

6- Date of program specification approval: 2019

7- Language: English

8. External Evaluator: Prof. Ali abd Elzaher - Pharmaceutics department – Faculty of Pharmacy –Assiut University)

9. **Internal Evaluator:** Prof. Hanan ElNahas

10- Academic Reference Standards:

a. The program ILOs were compared to the general guideline for postgraduate studies, 1st Edition, February 2009 issued by (NAQAA) (National Authority for Quality Assurance and Accreditation).

b. The program ILOs were compared to PhD program delivered by University of Washington, Department of Pharmaceutics.

B- Professional Information

1- Program aims:

The PhD program, Zagazig University is a 3-5 five years pharmacy education offering a PHD degree in pharmaceutical sciences (Pharmaceutics). This Program aims at providing postgraduate students with knowledge, skills and abilities needed to practice the pharmacy profession effectively in various settings including Research Institutes,

private and public medical laboratories, universities, National Quality Control Centers (foods & drugs) and Ministry of Health.

The program aims are summarized as follows:

1. Build up the advanced and in-depth knowledge and skills in areas related to drug targeting and nanotechnology applications in drug delivery as well as solid dosage forms and packaging.

2- Develop students capabilities to critically evaluate current research and practice.

3- Produce graduates with critical thinking, integrative capabilities as well as communication and problem-solving skills.

4-Develop individual research abilities that include: formulating a research question, study design, data collection and analysis and preparation of a published research.

5- Acquire students ethical and legal standards of research and professional practice.

2- Graduate attributes:

They should acquire the necessary attributes & skills in various nanotechnology applications including the following:

1- Figure out the advanced aspects of pharmaceutical drug delivery and drug targeting as well as science of packaging.
2- Capable of design research projects.
3- analyze the information with good interpretation of experimental results
4- Write manuscripts following the international standards required for publication.
5- Show Self-motivation, attention to detail, time-management, communication and computer skills

6- Demonstrate ethical, legal, social and civic responsibility as a researcher and member of the discipline

3-Intended Learning Outcomes (ILOs):

The Program provides excellent opportunities for students to demonstrate knowledge and understanding qualities and develop skills appropriate for **Pharmaceutics** PhD of sciences degree.

3-1- Knowledge and Understanding :

On successful completion of the PHD degree Program, students will be able to:

A.1- Outline the basic theories and principles of drug targeting, different solid oral dosage forms and packaging.

A.2- Illustrate different types of packaging materials and their properties as well as incompatibility with different drugs.

A.3- Mention different solid oral dosage forms, formulation as well as evaluation.

A.4- Outline new trends in drug delivery for optimal drug targeting.

A.5 - Illustrate ethical and legal principles in academic practice and research.

A.6- Outline different aspects and principles that are followed in quality assurance during manufacturing of different dosage forms

A.7 - Identify the influence of recent delivery systems in improving pharmaceutical industry and patient outcomes.

3-2 - Intellectual Skills:

On successful completion of the PhD degree Program, students will be able to:

B.1- Analyze information in the field of pharmaceutics and data obtained from specific and suitable research.

B.2- Suggest possible and applicable solutions for different problems in the field of drug formulation and evaluation that may be observed during research.

B.3- Integrate knowledge of pharmaceutics to propose solutions for research and professional problems .

B.4- Write reports and scientific papers on the results obtained from different pharmaceutics research.

B.5- Identify the possible hazards that may rise during research with suggestion of management strategies.

B.6- Write a planned protocol that should be followed during research to improve performance.

B.7- Take important decisions and enhance the responsibility of each individual to improve the pharmaceutical research.

3-3 - Professional and Practical Skills:

It is intended that, on successful completion of the PhD degree Program, students will be able to:

C.1- Implement a wide range of professional skills and modern pharmaceutical technologies during research.

C.2- Interpret experimental data and write professional reports.

C.3- Perform up to date methods and techniques during different pharmaceutical researches.

C.4- Develop new methods and tools to improve work in pharmaceutical laboratories.

3-4 - General and Transferable Skills:

On successful completion of the PhD degree Program, students will be able to:

D.1- Communicate effectively with others.

D.2- Develop different computer skills.

D.3- Enhance self learning with evaluations of the trained persons in pharmaceutics fields.

D.4- Collect up to date and the required information from different sources like Books, journals, papers and internet for improving knowledge.

D.5- Work effectively as a member of team.

D.6- Develop task and time management skills.

4- Academic Standards:

a. The program ILOs were compared to the general guideline for postgraduate studies, 1st Edition, February 2009 issued by (NAQAA) (National Authority for Quality Assurance and Accreditation).

b. The program ILOs were compared to PhD program delivered by University of Washington, Department of Pharmaceutics.

Matrix I: Comparison between PhD degree program ILOs and the Academic Reference Standards (ARS, 2009)

	ARS	Program ILOs for pharmaceutics department
Knowledge and Understanding	2.1.1- Fundamental and in-depth knowledge and basic theories in the field of specialty and the closely related areas of pharmaceutical sciences.	A.1- Outline the basic theories and principles of drug targeting, different solid oral dosage forms and packaging. A.2- Illustrate different types of packaging materials and their properties as well as incompatibility with different drugs. A.3- Mention different solid oral dosage forms, formulation as well as evaluation. A.4- Outline new trends in drug delivery for optimal drug targeting.
	2.1.2- Fundamentals, methods, techniques, tools and ethics of scientific research.	A.5 - Illustrate ethical and legal principles in academic practice and research.
	2.1.3- The ethical and legal principles in pharmacy and academic practices.	
	2.1.4- The principles and bases of quality assurance in professional practice in the field of specialization.	A.6- Outline different aspects and principles that are followed in quality assurance during manufacturing of different dosage forms
	2.1.5- All relevant knowledge concerning the impact of professional practice on society and environment and the ways of their conservation and development.	A.7 - Identify the influence of recent delivery systems in improving pharmaceutical industry and patient outcomes.

Intellectual Skills	2.2.1- Analyze and evaluate the data in his\her specified area and utilize them in logical inference processes (induction/deduction).	B.1- Analyze information in the field of pharmaceutics and data obtained from specific and suitable research.
	2.2.2- Propose solutions to specified problems in the light of the available data (information).	B.2- Suggest possible and applicable solutions for different problems in the field of drug formulation and evaluation that may be observed during research.
	2.2.3- Conduct research studies that add to the current knowledge. 2.2.8- Be creative and innovative.	B.3- Integrate knowledge of pharmaceutics to propose solutions for research and professional problems .
	2.2.4- Formulate scientific papers.	B.4- Write reports and scientific papers on the results obtained from different pharmaceutics research.
	2.2.5- Asses hazards and risks in professional practice in his \ her areas of specialization.	B.5- Identify the possible hazards that may rise during research with suggestion of management strategies.
	2.2.6- Plan to improve performance in the pharmaceutical area of interest.	B.6- Write a planned protocol that should be followed during research to improve performance.
	2.2.7- Take Professional decisions and bears responsibility in wide array of pharmaceutical fields.	B.7- Take important decisions and enhance the responsibility of each individual to improve the pharmaceutical research.
	2.2.9- Manage discussions and arguments based on evidence and logic.	
Professional and Practical Skills	2.3.1- Master basic and modern professional skills in the area of specialization.	C.1- Implement a wide range of professional skills and modern pharmaceutical technologies during research.
	2.3.2- Write and critically evaluate professional reports.	C.2- Interpret experimental data and write professional reports.

	2.3.3- Evaluate and develop methods and tools existing in the area of specialization. 2.3.5- Plan to improve professional practice and to improve the performance of other scholars.	C.4- Develop new methods and tools to improve work in pharmaceutical laboratories
	2.3.4- Properly use technological means in a better professional practice.	C.3- Perform up to date methods and techniques during different pharmaceutical researches
General and Transferable Skills	2.4.1- Effective Communication in its different forms.	D.1- Communicate effectively with others.
	2.4.2- Effective use of information technologies to improve professional practices.	D.2- Develop different computer skills.
	2.4.3- Help others to learn and evaluate their performance.	D.3- Enhance self learning with evaluations of the trained persons in pharmaceutics fields.
	2.4.4- Self-assessment and continuous learning.	
	2.4.5- Use various sources to get information and knowledge.	D.4 - Collect up to date and the required information from different sources like Books, journals, papers and internet for improving knowledge.
	2.4.6- Work as a member and lead a team of workers.	D.6- Work effectively as a member of team.
	2.4.7- Direct scientific meetings and to manage time effectively.	D.7- Develop task and time management skills.

Matrix 2: Comparison of the program aims with Ph.D program delivered by University of Washington, Department of Pharmaceutics.

Ph.D program objectives delivered by University of Washington	Zagazig Program aims
trains research scholars in the fundamental aspects of drug disposition and drug action. Areas of emphasis include: 1) drug delivery – processes for enhancing the absorption of a drug and targeting it to the site of action in order to improve therapeutic effect; 2) drug metabolism – enzyme catalyzed molecular transformations that often impart different disposition and pharmacological properties compared to the parent molecule; 3) drug excretion – the transport of drug molecules into target tissues (e.g., brain and placenta) and excretory fluids (renal filtrate and bile); and 4) pharmacometrics and physiologically based modeling of drug disposition and action	1. Build up the advanced and in-depth knowledge and skills in areas related to drug targeting and nanotechnology applications in drug delivery as well as solid dosage forms and packaging. **Covered Partially**
possess expertise in basic biochemical, cellular and molecular techniques and quantitative analytical methods, as well as technical skills for the elaboration of mathematical models that describe the kinetics of drug disposition and action.	**Not covered**

capable of investigating the causes of inadequate exposure to a drug at the target site and elucidating the relationship between the kinetics of drug and metabolites in various body compartments or tissues and the manifestation of pharmacologic, therapeutic and toxic effects	
probe the impact of alteration in physiological and biochemical processes, which may occur due to disease states or genetic variations, on drug disposition and pharmacological response.	
Graduates of the Pharmaceutics doctoral program will possess expertise with in vitro methodologies, which students can acquire	4-Develop individual research abilities that include: formulating a research question, study design, data collection and analysis and preparation of a published research.
gain experience in the conduct of pharmacokinetic and pharmacodynamic studies in animals and humans	
Pharmaceutics graduate student will interact with clinicians, medicinal chemists, biochemists, pharmacologists, analytical chemists, physiologists and biostatisticians. This will be possible because their training is highly interdisciplinary at the didactic and research levels.	2- Develop students capabilities to critically evaluate current research and practice. 3- Produce graduates with critical thinking, integrative capabilities as well as communication and problem-solving skills.
The Pharmaceutics faculty expect students in its graduate program to develop an individual career development plan that integrates this coursework with relevant knowledge gained from within the broader University community and from outside sources in order to best prepare themselves for the career that they envision	
Students in the Pharmaceutics graduate program must adhere to the very highest standards of academic and professional conduct	5- Acquire students ethical and legal standards of research and professional practice.

5-Curriculum Structure and Contents:

a- Program duration: **3- 5** years

b- Program structure:

- The PhD program can be completed in 3-5 years.
- The Faculty of pharmacy implements the credit hour system.
- The program is structured as:

1- Courses:

No. of credit hours for program courses:

Special: (3x4) 12

2- Thesis: 30 hours

The candidate must complete a research project on an approved topic in the Pharmaceutical Sciences. To fulfill this requirement the student must present (written and orally) a research proposal and write a thesis.

3- General University Requirements: 10 credit hours including:

a- TOEFL (500 units)

b- Computer course

c-Program Curriculum:

Course Code	Course Title	Credit hours	Program ILOs Covered
	Special Courses:		
Esp4	Drug targeting	4	A1, A4, A7, B2, D2, D6
Esp5	Packaging	4	A1, A2, A6, B2, D2, D6

Esp6	Solid oral dosage forms	4	A1, A3, A6, B2, D1, D4
	Thesis	30	A1, A2, A3, A4, A5, A6, A7, B1, B2, B3, B4, B5, B6, B7, C1, C2, C3,C4, D1, D2, D3, D4, D5, D6, D7

6-Program admission requirements:

Applicants are admitted to PhD degree any time throughout the academic year upon fulfillment of the following:

1. The applicants should be holders of Bachelor in Pharmaceutical Sciences from any Faculty of Pharmacy and also finish M.Sc. degree affiliated to the Egyptian Universities affiliated to the Egyptian Supreme Council of Universities (ESCU).
2. Students should fulfill all the admission requirements stated by the concerned Departmental Board.

Regulations to complete the program:

Conditions of granting the degree

The Faculty Council, in compliance with the concerned Departmental Board as well as Graduate Studies and Research Committee recommendation awards the PhD degree upon fulfillment of the following requirements:

1. Carrying out a deep research in the area of specialization for at least two calendar years from the time of registration.
2. The student has to succeed in all courses examinations.

3. Acceptance of the research thesis by the judges Committee according to statement 104 of universities regulating law.

Cancellation of Registration

The Faculty Board is allowed to cancel registration for PhD programs in the following circumstances:

1. Student's failure to pass the course examinations for two times.
2. Student's nonattendance or unsatisfactory progress in research work being reported by the advisors to the Departmental Board and forwarded to the Graduate Studies and Research Committee for approval of cancellation.
3. Dissertation refusal by the Jury Committee.

Incapability of the student to graduate by the deadlines indicated

7- Admission Policy:

The faculty complies with the admission regulations and requirements of the Egyptian Supreme Council of Universities (ESCU).

8-Student assessment methods:

Method	ILOS
Written exam	Knowledge and Understanding and Intellectual Skills
Oral exam	Knowledge and Understanding ,Intellectual Skills and General and Transferable Skills
Activity	Intellectual Skills and General and Transferable Skills
Seminars	Knowledge and Understanding ,Intellectual Skills & General and Transferable Skills

Follow up	Professional and practical Skills & General and Transferable Skills
Thesis and oral presentation	Knowledge and Understanding, Intellectual Skills, Professional and practical Skills & General and Transferable Skills

Grade Scale	Grade point average value (GPA)	Numerical scale
A+	5	≥ 95%
A	4.5	90- < 95%
B+	4	85- < 90%
B	3.5	80- < 85%
C+	3	75- < 80%
C	2.5	70- < 75%
D+	2	65- < 70%
D	1.5	60- < 65%

9-Failure in Courses:

Students who fail to get 60% (1 point)

10-Methods of program evaluation

Evaluator	Method	Sample
Internal evaluator Prof. Hanan ElNahas	Program evaluation Courses evaluation	Program report Courses report
External evaluator Prof. Ali Abd Elzaher, Assiut University	Program evaluation Courses evaluation	Program report Courses report

Others methods	Matrix with ARS International Benchmark Questionnaires	**100%**

Program coordinator **Head of Department**

تم اعتماد التوصيف بمجلس القسم بتاريخ

Special courses

Drug Targeting

Course specification of Drug Targeting

Course specifications:

- **Program on which the course is given:** PhD of Pharmaceutical Sciences
- **Major or Minor element of program:** Major
- **Department offering the program:** Pharmaceutics Dept.
- **Department offering the course:** Pharmaceutics Dept.
- **Date of specification approval:** 2019

1- Basic information:

Title: **Drug Targeting** Code: ESP 4
Credit hours: 4 hrs/week Lectures: 4 hrs/week
Total: 4 hrs/week

2- Overall aim of the course:

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

Discuss factors affecting different ADME processes, new systems applied for drug targeting and different mechanisms of drug release.

3- Intended learning outcome s (ILO's) of Drug Targeting:

Knowledge and Understanding	
a1	Discuss basic bioavailability concepts and different factors affecting bioavailability
a2	Outline different types of targeting delivery systems with drug release mechanisms
a3	Describe conventional and modern approaches for transdermal and vaginal drug delivery
Intellectual skills	
b1	Suggest the appropriate drug targeting system
b2	Solve different problems related to low drug absorption
General and Transferable skills	
d1	Use information technology to collect and present information.

d2	Work effectively as a member of a team

4. Course Content of Drug Targeting (PhD degree):

Week	Lecture content (4 hr/w)
1st	Drug Delivery: The Basic Concepts: - The concept of bioavailability - The process of drug absorption
2nd	Drug Delivery: The Basic Concepts: (Cont.) - Pharmacokinetic processes - Timing for optimal therapy - Drug delivery considerations for the 'new biotherapeutics'
3rd	Drug Delivery: Market Perspectives: - Commercial importance of advanced drug delivery technologies - Market analysis - Industry evolution and structure
4th	- Terminology of drug delivery and targeting - Rate-controlled release in drug delivery and targeting - Drug targeting systems - Dosage forms for advanced drug delivery and targeting systems
5th	Rate Control in Drug Delivery and Targeting: Fundamentals and Applications to Implantable Systems: - Advantages and disadvantages of implantation therapy - Biocompatibility issues - Non-degradable polymeric implants
6th	Rate Control in Drug Delivery and Targeting: Fundamentals and Applications to Implantable Systems(Cont.) - Biodegradable polymeric implants - Implantable pumps
7th	Transdermal Drug Delivery - Introduction - Structure and physiology of the skin - Factors affecting transdermal bioavailability
8th	Transdermal Drug Delivery

	- Advantages and disadvantages of transdermal drug delivery - Current technologies for transdermal drug delivery
9th	Transdermal Drug Delivery - New and evolving technologies for transdermal drug delivery
10th	Vaginal Drug Delivery - Introduction - Structure and physiology of the vagina - Physiological factors affecting vaginal drug delivery
11th	Vaginal Drug Delivery - Formulation factors affecting vaginal drug delivery - Advantages and disadvantages of vaginal delivery
12th	Vaginal Drug Delivery - Current technologies in vaginal drug delivery - New technologies in vaginal drug delivery
13th	Tutorial
14th	Presentation about selected topics (self learning part)
15th	Final exam

5- Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion

6- Student Assessment methods:

Written exams to assess: a1, a2, a3, b1, b2
Oral exam to assess: a1, a2, a3, b1, b2
Activities to assess: d1, d2

Assessment schedule:

Assessment (1): Activity	Week 14
Assessment (2): Written exam	Week 15
Assessment (3): oral exam	Week 15

Weighting of Assessment:

Assessment method	Marks	Percentage
• Activity	10	10 %
• Written exam	75	75 %
• Oral exam	15	15 %
TOTAL	**100**	**100%**

7- References and books:

A-Scientific Papers

Journal of drug targeting

B-Essential books: Drug Delivery and Targeting: For Pharmacists and Pharmaceutical Scientists. Hillery A. M., Andrew W. Loyd and James Swarbrick (2001)

C- Suggested books: Remington's Pharmaceutical Science. Alfonso, R. Gennaro, 17 thedn, Mack Publishing Company, USA. (1985).

D- Websites: Pubmed, Sciencedirect, Nejm, Weilyinterscience

Facilities required for teaching and learning:

1. **For lectures:** Black (white) boards, data show.

- **Course Coordinator: Prof.Dr/ Nagia Ahmed El-Megrab**
- **Head of Department: Prof.Dr/ Nagia Ahmed El-Megrab**
- **Date: 2019-9-23 تم اعتماد التوصيف بمجلس القسم بتاريخ**

Matrix I of Drug targeting

	Course Contents	ILOs of Drug targeting course						
		Knowledge and understanding			Intellectual skills		Transferable and general skills	
		a1	a2	a3	b1	b2	d1	d2
1	Drug Delivery: The Basic Concepts: The concept of bioavailability The process of drug absorption	x						
2	Drug Delivery: The Basic Concepts: (Cont.) Pharmacokinetic processes Timing for optimal therapy Drug delivery considerations for the 'new biotherapeutics'	x						
3	Drug Delivery: Market Perspectives: Commercial importance of advanced drug delivery technologies Market analysis Industry evolution and structure		x		x			
4	Terminology of drug delivery and targeting Rate-controlled release in drug delivery and targeting Drug targeting systems Dosage forms for advanced drug delivery and targeting systems		x		x			
5	Rate Control in Drug Delivery and Targeting: Fundamentals and Applications to Implantable Systems: Advantages and disadvantages of implantation therapy Biocompatibility issues Non-degradable polymeric implants	x			x			
6	Rate Control in Drug Delivery and Targeting: Fundamentals and Applications to Implantable Systems(Cont.) Biodegradable polymeric implants Implantable pumps		x		x			
7	Transdermal Drug Delivery Introduction Structure and physiology of the skin Factors affecting transdermal bioavailability			x				
8	Transdermal Drug Delivery Advantages and disadvantages of transdermal drug delivery			x				

	Current technologies for transdermal drug delivery							
9	Transdermal Drug Delivery New and evolving technologies for transdermal drug delivery			x		x		
10	Vaginal Drug Delivery Introduction Structure and physiology of the vagina Physiological factors affecting vaginal drug delivery			x				
11	Vaginal Drug Delivery Formulation factors affecting vaginal drug delivery Advantages and disadvantages of vaginal delivery			x				
12	Vaginal Drug Delivery Current technologies in vaginal drug delivery New technologies in vaginal drug delivery			x		x		
13	Tutorial			x				
14	Presentation about selected topics (self learning part)	x	x	x	x	x	x	x

Matrix II of Drug Targeting

ARS		Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods		Method of assessment		
						Lecture	Self learning	Written exam	Oral exam	Activity
2.1	2.1.1- Fundamental and in-depth knowledge and basic theories in the field of specialty and the closely related areas of pharmaceutical sciences. 2.1.5- All relevant knowledge concerning the impact of professional practice on society and environment and the ways of their conservation and development.	A.1- Outline the basic theories and principles of drug targeting, different solid oral dosage forms and packaging. A.4- Outline new trends in drug delivery for optimal drug targeting. A.7 - Identify the influence of recent delivery systems in improving pharmaceutical industry and patient outcomes.	a1 a2 a3	Drug Delivery: The Basic Concepts: The concept of bioavailability The process of drug absorption Drug Delivery: The Basic Concepts: (Cont(. Pharmacokinetic processes Timing for optimal therapy Drug delivery considerations for the 'new biotherapeutics' Drug Delivery: Market Perspectives: Commercial importance of advanced drug delivery technologies Market analysis Industry evolution and structure Terminology of drug	Textbooks, Scientific papers and self learning	x	x	X	X	

				delivery and targeting Rate-controlled release in drug delivery and targeting Drug targeting systems Dosage forms for advanced drug delivery and targeting systems Rate Control in Drug Delivery and Targeting: Fundamentals and Applications to Implantable Systems: Advantages and disadvantages of implantation therapy Biocompatibility issues Non-degradable polymeric implants Rate Control in Drug Delivery and Targeting: Fundamentals and Applications to Implantable Systems(Cont(. Biodegradable polymeric implants Implantable pumps							

				Transdermal Drug Delivery Introduction Structure and physiology of the skin Factors affecting transdermal bioavailability Transdermal Drug Delivery Advantages and disadvantages of transdermal drug delivery Current technologies for transdermal drug delivery Transdermal Drug Delivery New and evolving technologies for transdermal drug delivery Vaginal Drug Delivery Introduction Structure and physiology of the vagina Physiological factors affecting vaginal drug delivery						

				Vaginal Drug Delivery Formulation factors affecting vaginal drug delivery Advantages and disadvantages of vaginal delivery Vaginal Drug Delivery Current technologies in vaginal drug delivery New technologies in vaginal drug delivery						
	2.2.2- Propose solutions to specified problems in the light of the available data (information).	B.2- Suggest possible and applicable solutions for different problems in the field of drug formulation and evaluation that may be observed during research.	b1 b2	Drug Delivery: Market Perspectives: Commercial importance of advanced drug delivery technologies Market analysis Industry evolution and structure Terminology of drug delivery and targeting Rate-controlled release in drug delivery and targeting Drug targeting systems Dosage forms for advanced drug	Textbooks, Scientific papers and self learning	x	x	X		

				delivery and targeting systems Rate Control in Drug Delivery and Targeting: Fundamentals and Applications to Implantable Systems: Advantages and disadvantages of implantation therapy Biocompatibility issues Non-degradable polymeric implants Rate Control in Drug Delivery and Targeting: Fundamentals and Applications to Implantable Systems(Cont(. Biodegradable polymeric implants Implantable pumps Transdermal Drug Delivery New and evolving technologies for transdermal drug delivery Vaginal Drug Delivery						

				Current technologies in vaginal drug delivery New technologies in vaginal drug delivery						
2.4	2.4.2- Effective use of information technologies to improve professional practices.	D.2- Apply modern techniques to improve pharmaceutical researches including computer skills, Language, others.	d1	Activity	Textbooks, Scientific papers and self learning		x			x
	2.4.6- Work as a member and lead a team of workers.	D.6- Work effectively as a member of team.	d2	Activity	Textbooks, Scientific papers and self learning		x			x

Packaging

Course specification of Packaging

A- Course specifications:

- **Program on which the course is given:** PhD of Pharmaceutical Sciences
- **Major or Minor element of program:** Major
- **Department offering the program:** Pharmaceutics Dept.
- **Department offering the course:** Pharmaceutics Dept.
- **Date of specification approval:** 2019

1- Basic information:

Title: **Packaging** Code: ESP 5
Credit hours: 4 hrs/week Lectures: 4 hrs/week
Total: 4 hrs/week

2- Overall aim of the course:

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

- Describe types, properties, problems and evaluation of packaging materials.

3- Intended learning outcome s (ILO's) of Packaging:

Knowledge and Understanding	
a1	Outline different types of packaging materials and their properties
a2	Mention Package-related contents in the official compendia
a3	Describe techniques used in packaging
Intellectual skills	
b1	Suggest modifications carried out on packaging materials to match the desired quality
General and transferable skills	
d1	Develop different computer skills
d2	Work effectively as a team member

4. Course Content of Packaging (PhD degree):

Week No.	Lecture content (4 hr/w)
1	• Properties of good packaging • Factors affecting packaging
2	• Moisture, Volatility, Heat, Light, Oxygen, Sterilization and mechanical shock
3	• Glass Types of glass Protection of light sensitive drugs in glass • Advantages and disadvantages of glass
4	• Plastics • General properties of plastics
5	• Types of plastics • Thermoplastic
6	• Types of plastics • Thermosetting
7	• Drug-plastic possible interactions Permeation • Leaching **(Presentation)**
8	• Drug-plastic possible interactions Sorption Chemical reactions • Physical alterations
9	• Metals
10	• Rubber
11	• Forms of pharmaceutical package • For liquids
12	• Forms of pharmaceutical package • For semi-solid
13	• Forms of pharmaceutical package • For solid
14	• Pouches, plaster package and unit dose packaging
15	Final exam

5- Teaching and Learning Methods:

- Lectures
- Self learning (Activities, Research….)
- Open discussion

6- Student Assessment methods:

Written exams to assess: a1, a2, a3, b1
Oral exam to assess: a1, a2, a3, b1
Activities to assess: d1, d2

Assessment method	Time	Marks	Percentage
Written exam	Week 15	75	75%
Oral exams	Week 15	15	15%
Activities	Week 7	10	10 %
Total	-----	100	100%

7- References and books:

A-Handouts

B- Essential books: Package Design Workbook: The Art and Science of Successful Packaging by Steven DuPuis and John Silva (2011).

C- **Suggested books:** Package Design Workbook: The Art and Science of Successful Packaging by Steven DuPuis and John Silva (2011).

D- **Websites:** Pubmed, Sciencedirect, Nejm, Weily interscience

Facilities required for teaching and learning:

1.For lectures: Black (white) boards, data show.

- **Course Coordinators: Prof Dr/ Hanaa Abd El-Fattah El-Ghamry**
- **Head of Department: Prof Dr/ Nagia Ahmed El-Megrab**
- **Date:** **2019-9-23 تم اعتماد التوصيف بمجلس الكلية بتاريخ**

Matrix I of Packaging

Course Contents		ILOs of Packaging course					
		Knowledge and understanding			Intellectual skills	Transferable and general skills	
		a1	a2	a3	b1	d1	d2
1	-Properties of good packaging - Factors affecting packaging	x		x			
2	Moisture, Volatility, Heat, Light, Oxygen, Sterilization and mechanical shock	x					
3	Glass - Types of glass - Protection of light sensitive drugs in glass - Advantages and disadvantages of glass	x					
4	• Plastics • General properties of plastics	x					
5	Types of plastics - Thermoplastic	x					
6	Types of plastics - Thermosetting	x					
7	Drug-plastic possible interactions - Permeation - Leaching Presentation		x		X	X	X
8	Drug-plastic possible interactions - Sorption - Chemical reactions - Physical alterations		x		X		
9	Metals	x					
10	Rubber	x					
11	Forms of pharmaceutical package - For liquids		x		X		
12	Forms of pharmaceutical package - For semi-solid		x		X		
13	Forms of pharmaceutical package - For solid		X		X		
14	Pouches, plaster package and unit dose packaging			x			

Matrix II of packaging

ARS		Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods		Method of assessment		
						Lecture	Self learning	Written exam	Oral exam	Activity
2.1	2.1.1- Fundamental and in-depth knowledge and basic theories in the field of specialty and the closely related areas of pharmaceutical sciences.	A.1- Outline the basic theories and principles of drug targeting, different solid oral dosage forms and packaging. A.2- Illustrate different types of packaging materials and their properties as well as incompatibility with different drugs.	a1 a3	Moisture, Volatility, Heat, Light, Oxygen, Sterilization and mechanical shock Types of glass - Protection of light sensitive drugs in glass - Advantages and disadvantages of glass Plastics -General properties of plastics Metals and Rubbers Types of plastic Properties of good packaging - Factors affecting packaging Pouches, plaster package and unit dose packaging	Textbooks, Scientific papers and self learning	X	x	x	x	

	2.1.4- The principles and bases of quality assurance in professional practice in the field of specialization.	A.6- Outline different aspects and principles that are followed in quality assurance during manufacturing of different dosage forms	a2	Drug-plastic possible interactions - Permeation - Leaching - Sorption - Chemical reactions Forms of pharmaceutical package	Textbooks, Scientific papers and self learning	x	x	x	x	
2.2	2.2.2- Propose solutions to specified problems in the light of the available data (information).	B.2- Suggest possible and applicable solutions for different problems in the field of drug formulation and evaluation that may be observed during research.	b1	Drug-plastic possible interactions Forms of pharmaceutical package - For liquids, solids and semi-solids	Textbooks, Scientific papers and self learning	X	x	x		
2.4	2.4.2- Effective use of information technologies to improve professional practices.	D.2- Develop different computer skills.	d1	Activity	Textbooks, Scientific papers and self learning		x			x
	2.4.6- Work as a member and lead a team of workers.	D.6- Work effectively as a member of team.	d2	Activity	Textbooks, Scientific papers and self learning		x			x

Solid Dosage Forms

Course specification of Solid Dosage Forms

A- Course specifications:

- **Program on which the course is given:** PhD of Pharmaceutical Sciences
- **Major or Minor element of program:** Major
- **Department offering the program:** Pharmaceutics Dept.
- **Department offering the course:** Pharmaceutics Dept.
- **Date of specification approval:** 2019

1- Basic information:

Title: **Solid Dosage Forms** Code: ESP 6
Credit hours: 4 hrs/week Lectures: 4 hrs/week
Total: 4 hrs/week

2- Overall aim of the course:

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

- Describe the properties of different solid dosage forms and their manufacture and evaluation

3- Intended learning outcome s (ILO's) of Solid dosage forms:

Knowledge and Understanding	
a1	Outline steps of development and design of tablets and capsules
a2	Describe the properties of different types of ingredients used in formulation of tablets and capsules
a3	Illustrate the different techniques and equipments used in manufacture of different solid dosage forms
Intellectual skills	
b1	Propose solutions for certain problems occurring in manufacture of solid dosage forms
General and transferable skills	
d1	Communicate effectively with others
d2	Collect information from different resources

4. Course Content of solid dosage forms (PhD degree):

Week	Lecture content (4 hr/w)
1st	• Design and formulation of compressed tablets
2nd	• Tablet manufacture
3rd	• Tableting equipment
4th	• Coated tablets
5th	• Evaluation of tablets
6th	• Recent developments in tableting
7th	• Historical development and role of capsules as a dosage form **(Presentation)**
8th	• Hard gelatin capsules
9th	• Manufacture of hard gelatin capsules
10th	• Filling of hard gelatin capsules
11th	• Soft gelatin capsules
12th	• Formulation and Manufacture of soft gelatin capsules
13th	• Soft/liquid-filled hard gelatin capsules
14th	• Evaluation of capsules
15th	Final exam

5- Teaching and Learning Methods:

- Lectures
- Self learning (Activities, Research….)
- Open discussion

6- Student Assessment methods:

Written exams to assess: a1, a2, a3, b1
Oral exam to assess: a1, a2, a3, b1
Activities to assess: d1, d2

Assessment method	Time	Marks	Percentage
Written exam	Week 15	75	75%
Oral exams	Week 15	15	15%
Activities	Week 7	10	10%
Total	-----	100	100%

7- References and books:
A-Scientific Papers

B- Essential books: Pharmaceutical dosage forms and drug delivery systems, Ansel, H. c., Popovich, N. G., Allen, L. V. 6 th edn, Williams and Wilkins (1995).

C- Suggested books:

1-Remington's Pharmaceutical Science Alfonso, R. Gennaro, 17 th edn, Mack Publishing Company, USA (1985).

2-Pharmaceutical dosage forms: parenteral medications (1993), Kenneth Kavis, Herbert A.lieberman and Leon lachman, 2 nd edition Marcel Dekker, Inc., 270 Madison Avenue, New York.

D- Websites: Pubmed, Science direct, Nejm, Weily interscience

Facilities required for teaching and learning:

1. **For lectures:** Black (white) boards, data show.

- **Course Coordinators: ProfDr/ Mahmoud Abdul-Ghany Mahdy**
- **Head of Department: Prof Dr/ Nagia Ahmed El-Megrab**
- **Date:** **تم اعتماد التوصيف بمجلس الكلية بتاريخ 2019-9-23**

Matrix I of Solid Dosage Forms

	Course Contents	ILOs of Solid dosage forms course					
		Knowledge and understanding			Intellectual skills	Transferable and general skills	
		a1	a2	a3	b1	d1	d2
1	Design and formulation of compressed tablets	X			x		
2	Tablet manufacture		X		X		
3	Tableting equipment			X			
4	Coated tablets	X					
5	Evaluation of tablets	X					
6	Recent developments in tableting	X			X		
7	Historical development and role of capsules as a dosage form Presentation	X				X	x
8	Hard gelatin capsules	X					
9	Manufacture of hard gelatin capsules		X	X			
10	Filling of hard gelatin capsules		X	X			
11	Soft gelatin capsules	X					
12	Formulation and Manufacture of soft gelatin capsules		X	X	X		
13	Soft/liquid-filled hard gelatin capsules	X					
14	Evaluation of capsules	X					

Matrix II of Solid Dosage Forms										
ARS		**Program ILOs**	**Course ILOs**	**Course contents**	**Sources**	**Teaching and learning methods**		**Method of assessment**		
						Lecture	Self learning	Written exam	Oral exam	Activity
2.1	2.1.1- Fundamental and in-depth knowledge and basic theories in the field of specialty and the closely related areas of pharmaceutical sciences.	A.1- Outline the basic theories and principles of drug targeting, different solid oral dosage forms and packaging. A.3- Mention different solid oral dosage forms, formulation as well as evaluation.	a1	Design and formulation of compressed tablets Coated tablets Recent developments in tableting Soft and hard gelatin capsules Soft/liquid-filled hard gelatin capsules Evaluation of tablets Historical development and role of capsules as a dosage form Evaluation of capsules	Textbooks, Scientific papers and self learning	x	x	x	x	
			a3	Manufacture of hard gelatin capsules Filling of hard gelatin capsules Formulation and Manufacture of soft gelatin capsules Tableting equipment	Textbooks, Scientific papers and self learning	x	x	x	x	

	2.1.4- The principles and bases of quality assurance in professional practice in the field of specialization.	A.6- Outline different aspects and principles that are followed in quality assurance during manufacturing of different dosage forms	a2	Tablet manufacture Manufacture of hard gelatin capsules Filling of hard gelatin capsules Formulation and Manufacture of soft gelatin capsules	Textbooks, Scientific papers and self learning	x	x	x	x	
	2.2.2- Propose solutions to specified problems in the light of the available data (information).	B.2- Suggest possible and applicable solutions for different problems in the field of drug formulation and evaluation that may be observed during research.	b1	Design and formulation of compressed tablets- Tablet manufacture- Formulation and Manufacture of soft gelatin capsules	Textbooks, Scientific papers and self learning	X	x	x		
2.4	2.4.1- Effective Communication in its different forms.	D.1- Communicate effectively with others.	d1	Activity	Textbooks, Scientific papers and self learning		x			x
	2.4.5- Use various sources to get information and knowledge.	D.4 - Collect up to date and the required information from different sources like Books, journals, papers and internet for improving knowledge.	d2	Activity	Textbooks, Scientific papers and self learning		x			x

Thesis Specification

PhD Thesis in Pharmaceutics

Course specifications:

- **Program on which the thesis is done:** PhD of Pharmaceutical sciences (Pharmaceutics)
- **Major or Minor element of program:** Major
- **Department offering the program:** Pharmaceutics Dept.
- **Department offering the thesis:** Pharmaceutics Dept.
- **Date of specification approval:** 2019

1- Basic information:

Title: **PhD of pharmaceutical sciences (pharmaceutics)**
Credit hours: **30 hrs**

2- Overall aim of the thesis:

On completion of the thesis, the students will be able to define and plan the project, identify and perform different techniques and methods used in the experimental work according to the designed protocol, derive and present the results of the study from the data collected, draw conclusions about the contribution to knowledge made by the study which may be concerned with the problem under investigation, the methods deployed or the student as researcher and provide a complete and accurate record of the material used in the study, cited consistently according to a recognized system.

3- Intended learning outcome's (ILOs):	
Knowledge and Understanding	
a1	Outline different principles of pharmaceutics and their possible application in the research study
a2	Demonstrate methods and techniques used during working in the area of specialization of research
a3	Understand the legal aspects of for professional and academic practices
a4	Illustrate the importance of quality assurance during the formulation of different dosage forms
a5	Define different practices that can be used in understanding the problem of the research and help in solving it
Intellectual skills	
b1	Solve problems related to practical work by obtained quantitative data from the practical work
b2	Discuss professional problems and suggest solutions rely on different pharmaceutical knowledge and recent information
b3	Plan a research in the field of drug delivery or targeting that allow discovery of modern and efficient techniques for drug targeting
b4	Integrate scientific results and write report following conducting research
b5	Manage risks and hazards related to professional practical area
b6	Outline principles that should be followed in research to develop laboratory performance
b7	Decide what to do with full responsibility in scientific research
b8	Demonstrate creativity and innovation in modifying techniques and in utilization of various therapy
b9	Discuss the obtained results in open sessions and revealed errors and how to avoid them.
Professional and practical skills	
c1	Apply different techniques related to practical thesis work.
c2	Use and evaluate practical data to write report
c3	Estimate laboratory techniques used in pharmaceutics and industrial pharmacy labs.

c4	Apply technology in methodology development during practical work.
c5	Improve performance by all possible means
General and Transferable skills	
d1	Interact with health care professional.
d2	Use information technology in review and thesis preparation
d3	Set rules for evaluation and judge others performance.
d4	Study independently and evaluate learning needs in pharmaceutics
d5	Reprocess up-to-date information in different areas under study and research
d6	Implement tasks as a member of a team.
d7	Utilize time effectively to achieve goals

4. Thesis Content:

Steps	Content
1st	Suggest the possible points/ problems of research that the candidate can work on in the frame of the aim of work and choose proper point. Collect all available information about this subject by all possible means. Use internet, journals, books and others thesis to get previous and recent information about the subject under study. Design the protocol including the steps of work following the suitable timetable. Increase the awareness of the recent pharmaceutical techniques that will be used during practical work and determined by the protocol. Integrate different knowledge (Pharmaceutics, industrial pharmacy, GMP, Hospital pharmacy, incompatibilities ……..) to solve suggested problem. Continuous evaluation to the thesis outcome according to the schedule.
2nd	Identify different practical techniques and methods to assess pharmacokinetic parameters related to the subject under study. Perform various techniques to improve physical and chemical characters of drugs under research Formulate many classes of drugs in new dosage forms

	(suppositories, capsules, tablets, …….) Operate scientific instruments according to instructions. Evaluate and manage hazards (chemical and biological) throughout the whole practical work. Organize the experimental work according to the designed protocol (either individual, parallel or sequential experiments). Induction of some diseases in experimental animals (Hypertension, inflammation, seizures…….). Separate biological samples (e.g. blood, plasma). Apply ethical recommendations during dealing with experimental animals Modify techniques required for the progression of work
3rd	Collect raw data for the tested pharmacokinetic parameters. Interpret raw data to get valuable information. Perform statistical analysis for the results. Present and describe the results graphically. Suggest solution to the problem understudy based on this presented data.
4th	Communicate with supervisors to discuss results Work effectively as a member of a team (e.g. Supervisors, various professionals and Technicians). Present the results periodically in seminars. Define ethics of scientific research. Write scientific reports on the obtained results with conclusive significance. Discuss obtained results in comparison with pervious literatures. Suggest possible recommendations based on the outcome of the thesis and decide future plans. Summarize the thesis in an understandable Arabic language for non professionals. Write references in the required form (Thesis, Paper…….). Demonstrate the thesis in a final power point presentation. Continue self-learning throughout the experimental work and writing scientific papers.

5- Teaching and Learning Methods:

- Self learning (Activities, Research….)
- Lab work
- Seminar
- reporting

- Critical thinking
- Solving problem
- Open discussion

6- References:

- **Websites:** Pubmed, Sciencedirect, Weilyinterscience

Facilities required for:

1-For practical work: U.V spectrophotometer, centrifuge, Dissolution, Vortex, HPLC, Analytical balance (4digit), Thermostatic water bath, Vacuum Oven

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- **Head of Department: Prof/Dr. Mahmoud Abdul Ghany Mahdy**

Program Matrix of PhD degree of Pharmaceutics

		Program ILOs																							
		Knowledge and Understanding							Intellectual skills							Professional and practical skills				General and Transferable skills						
		A1	A2	A3	A4	A5	A6	A7	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D1	D2	D3	D4	D5	D6	D7
Special courses	Drug targeting	X			X			X		X											X				X	
	Packaging	X	X				X			X											X				X	
	Solid oral dosage forms	X		X			X			X										X			X			
Thesis		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X