Zagazig University

Faculty of Pharmacy

Medicinal Chemistry Department

Program and Course Specifications

Master and Ph.D.

Degrees

2019

I) Master Program

Program Specification

Program Specification

A- Basic Information

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

2- Program type: Monodisciplinary.

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

4-Department: Medicinal Chemistry

5-Teaching language: English

6-External evaluator: Prof.Dr.Samir El-Moghazy

7-Internal evaluator: Prof.Dr.Mohammed El-sadek

8- Coordinator: Prof. Dr. Sayed Lashin

9- Date of program specification approval: 2019

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. M. Pharm. Sci. Degree in Medicinal Chemistry was compared to MSc Medicinal Chemistry provided by School of Pharmacy, University of Illinois at Chicago,USA

B- Professional Information

1- Program aims:

Master's program, Zagazig University (PSPZU) is a 3-5 five years pharmacy education offering a Master's degree in pharmaceutical sciences (Medicinal Chemistry). This program aims at providing postgraduate students with knowledge, skills and abilities needed to work 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. Provide the community with highly qualified professionals demonstrating an ability to design, synthesize novel drug candidates as well as using up to date quantitative techniques in drug analysis and validation of analytical results. The program also provides the graduates with skills related to team working, research, problems solving, critical thinking and decision making .

- Graduate attributes:

By the end of the M.Pharm.Sci programme , the graduate should be able to:

1- Demonstrate knowledge about drug-target interactions.
2- Design experiments to solve problems of drug synthesis.
3- Analyze and interpret qualitative and quantitative data obtained from analysis of drugs using different instrumental techniques.
4- Use effectively the principles of scientific research in dealing with procedures and techniques of drug design and drug synthesis.
5- Apply ethics of scientific research as well as guidelines of good laboratory practice.
6- Develop research skills including writing and evaluation of scientific reports .
7- Develop continuous and self learning abilities .
8- 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 **Medicinal chemistry** 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 the concepts associated with medicinal chemistry and related subjects including: Drug design, Instrumental Analysis & chromatography, Physical chemistry, analysis of drugs and quality control as well as Drug Stability.

A.2- Identify the applications of theories in developing molecules and drug design that serves the community and the patients.

A.3- Record the recent advances in the field of medicinal chemistry & their related subjects including computer-aided drug design & validation parameters in drug analysis.

A.4- Mention the legal aspects of the profession of Medicinal chemistry.

A.5- Identify the principles of quality assurance to ensure quality in the wide field of medicinal chemistry.

2-2 - Intellectual Skills:

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

B.1- Analyze and interpret data obtained from Instrumental analysis of different drugs .

B.2- Solve different practice problems even if there is lack of information.

B.3- Solve professional problems related to drug design and drug synthesis.

B.4- Choose the appropriate drug analysis technique and take the necessary precautions to achieve the analysis.

B.5- Evaluate risks of the experiments and the techniques adopted in research and handle the chemicals safely.

B.6- Plan a research project including problems definition and taking professional decisions.

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-Implement a wide range of synthetic and measurement techniques and develop appropriate practical skills within the workplace.

C.2- Evaluate the results of drug synthesis and analysis.

C.3- Conduct various methods and chemical techniques of analysis and assure the quality and suitability of instruments

C.4- Conduct research and write concrete reports on the obtained results with conclusive significances.

2-4 - General and Transferable Skills:

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

D.1- Communicate and express clearly ideas both orally and in writing.

D.2- Demonstrate appropriate information technology skills especially in the areas of word processing, internet communication, information retrieval and online literature searching.

D.3- Practice self assessment of learning needs.

D.4-Retreive information from a wide range of sources.

D.5- Evaluate performance of others.

D.6- Work effectively in a group environment.

D.7- Manage time and complete work to deadlines

D.8- Manage learning and appreciate the importance of continuing professional development.

3- Academic standards:

Matrix1: Comparison of M. Pharm. Sci. Degree in Medicinal Chemistry program 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 Medicinal chemistry)
1. Apply the specialized knowledge he has acquired in his professional practice	1- Demonstrate knowledge about drug-target interactions
2. Identify and solve professional problems	2-Design experiments to solve problems of drug synthesis. 3- Analyze and interpret qualitative and quantitative data obtained from analysis of drugs using different instrumental techniques.
4- Show good communication and leadership skills 5. Take decisions using available information	8-Demonstrate effective communication, decision making and leadership skills.
4. Use technology effectively in his professional practice 6. Use available resources efficiently	4-Use effectively the principles of scientific research in dealing with procedures and techniques of drug design and drug synthesis.

	6- Develop research skills including writing and evaluation of scientific reports
7. Aware of his role in community service and development	5- Apply ethics of scientific research as well as guidelines of good laboratory practice.
8. Reflect commitment to integrity, credibility and accountability	
9. Be a lifelong learner and able to develop himself	7-Develop continuous and self learning abilities

Matrix 2: Comparison between Master degree program ILOs and the Academic Reference Standards

	ARS	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 the concepts associated with medicinal chemistry and related subjects including: Drug design, Instrumental Analysis & chromatography, Physical chemistry, analysis of drugs and quality control as well as Drug Stability.
	2.1.2- Mutual influence between professional practice and its impact on the environment.	A.2- Identify the applications of theories in developing molecules and drug design that serves the community and the patients.
	2.1.3- Scientific developments in the area of specialization.	A.3- Record the recent advances in the field of medicinal chemistry & their related subjects including computer-aided drug design , validation parameters in drug analysis& Advanced medicinal chemistry.
	2.1.4- Moral and legal principles for professional practice in the area of specialization.	A.4- Mention the legal aspects of the profession of Medicinal chemistry.

	2.1.5- Principles and the basics of quality in professional practice in the area of specialization.	A.5- Identify the principles of quality assurance to ensure quality in the wide field of medicinal chemistry.
	2.1.6- The fundamentals and ethics of scientific research.	
Intellectual Skills	2.2.1- Analyze and evaluate information in the field of specialization and analogies to solve problems	B.1- Analyze and interpret data obtained from Instrumental analysis of different drugs .
	2.2.2- Solve specified problems in the lack or missing of some information.	B.2- Solve different practice problems even if there is lack of information.
	2.2.3-Correlate and integrate different pharmaceutical knowledge to solve professional problems.	B.3- Solve professional problems related to drug design and drug synthesis.
	2.2.4- Conduct research and write scientific report on research specified topics.	B.4- Choose the appropriate drug analysis technique and take the necessary precautions to achieve the analysis.
	2.2.5- Evaluate and manage risks and potential hazards in professional practices in the area of specialization	B.5- Evaluate risks of the experiments and the techniques adopted in research and handle the chemicals safely.
	2.2.6- Plan to improve performance in the field of specialization.	B.6- Plan a research project including problems definition and taking professional decisions
	2.2.7- Professional decision-making in the contexts of diverse disciplines.	

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 synthetic and measurement techniques and develop appropriate practical skills within the workplace.
	2.3.2- Write and evaluate professional reports.	C.2- Evaluate the results of drug synthesis and analysis. C.4- Conduct research and write concrete reports on the obtained results with conclusive significances.
	2.3.3- Assess methods and tools existing in the area of specialization.	C.3- Conduct various methods and chemical techniques of analysis and assure the quality and suitability of instruments.
General and Transferable Skills	2.4.1- Communicate effectively.	D.1- Communicate and express clearly ideas both orally and in writing.
	2.4.2- Effectively use information technology in professional practices	D.2- Demonstrate appropriate information technology skills especially in the areas of word processing, internet communication, information retrieval and online literature searching.
	2.4.3- Self-assessment and define his personal learning needs.	D.3- Practice self assessment of learning needs.
	2.4.4- Use variable sources to get information and knowledge.	D.4-Retreive information from a wide range of sources.
	2.4.5- Set criteria and parameters to evaluate the performance of others	D.5- Evaluate performance of others.
	2.4.6- Work in a team and lead teams carrying out various professional tasks.	D.6- Work effectively in a group environment.
	2.4.7- Manage time effectively.	D.7-Manage time and complete work to deadlines
	2.4.8- Continuous and self learning.	D.8- Manage own learning and appreciate the importance of continuing professional development.

Matrix 3: Comparison of M. Pharm. Sci. Degree in Medicinal Chemistry with MSc Medicinal Chemistry provided by School of Pharmacy, University of Illinois at Chicago,USA

School of Pharmacy, University of Illinois at Chicago,USA	M. Pharm. Sci. Degree in Medicinal Chemistry
MDCH 572. Drug Design. Quantitative structure-activity relationships, computer graphics, molecular modeling and simulation, and chemometrics as applied to drug design and discovery.	**Drug design** outline principles of drug design, docking. utilize combinatorial chemistry in synthesis of drugs.
MDCH 562. Spectroscopy in Medicinal Chemistry. The fundamental principles used to determine structure and conformation in molecules, emphasizing spectroscopic methods useful in solving structural problems and in analyzing dynamic biological processes. **MDCH 585. Practical Liquid Chromatography-Mass Spectrometry.** Introductory-level course combining classroom discussions with laboratory demonstrations to provide basic practical knowledge and hands-on experience in the operation of liquid chromatography and mass spectrometry instrumentation.	**Advanced Instrumental Analysis & chromatography I** demonstrate fundamental knowledge and basic theories in instrumental analysis , state the concepts of diagnosing cardiac diseases, G.I.T diseases and infections through IR, HNMR and UV spectrophotometry and describe new aspects of (HPLC), HPLC/Mass, Gas Chromatography (GC) and GC/Mass and their medicinal applications.
MDCH 412. Pharmaceutical Applications of Genomics and Bioinformatics. Introduction to genomics and bioinformatics for advanced pharmacy students. Principles of gene expression, DNA sequencing in bacterial and human genomes, with emphasis on diagnostic and therapeutic applications.	**Advanced Medicinal Chemistry** illustrate strategies of gene therapy and show specific information about anti-aging drugs and antisense drugs.

4-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:		
M109	Drug design	4	A1,A2,A3,B3,D2
M101	Advanced Instrumental Analysis & chromatography I	4	A1, A3, B1, D2
M106	Physical chemistry	4	A1,B1,B3,D2, D6

ME3	Elective A Good practice for analysis of drugs and quality control	4	A1, A5, A3, B1, B5, D2, D4
ME2	Elective B Drug Stability	4	A1, B6, B2, D2, D4
	Special Courses:		
Msp1	Computer Aided Drug Design	4	A1, A3, B3, D2, D4
Msp2	Validation Parameters in Drug Analysis	4	A1, A3, A5, B1, B4, D2, D4
Msp3	Advanced Medicinal Chemistry	4	A3, B2, D2, D4
	Thesis	30	A1, A2, A3, A4, A5, B1, B2, B3, B4, B5, B6, C1, C2, C3, C4, D1, D2, D3, D4, D5, D6, D7 and D8

5-Program admission requirements:

General Admission Conditions

- 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 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 400).

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 programme:

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 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.

6- Admission Policy:

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

7-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%

1- Failure in courses

Students who fail to get 60% (1 Point)

In this case, students can register the course again and their grades are those obtained on repeating the course with maximum GPA being 3

9-Methods of program evaluation

Evaluator	Method	Sample
Internal evaluator: Professor Dr. Elsayed Lashen	Program evaluation Courses evaluation	Program report Courses report
External evaluator: Professor Dr. Samir Elmogazy	Program evaluation Courses evaluation	Program report Courses report
Others methods • **Stockholders** • **Alumni**	Matrix with NARS Questionnaires	The Matrix Results of the questionnaires

Program coordinator **Head of Department**

Prof. Dr. Sayed Lashin **Prof. Dr. Kamel A. Metwally**

Drug Design

Course specification of Drug Design

Course specifications:

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

1- Basic information:

Title: **Drug Design** Code: M109

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

On completion of the course, the students will be able to outline principles of drug design, docking and utilize combinatorial chemistry in synthesis of drugs.

3. Intended learning outcome s (ILOs) of Drug Design

Knowledge and Understanding	
a1	Outline principles of drug design and combinatorial chemistry.
a2	Describe applications of drug design and QSAR.
a3	Illustrate clearly the up-to date information & methods in drug design and docking.
Intellectual skills	
b1	Solve or propose solutions to specified problems in drug design

General and Transferable skills	
d1	Write reports and present it.

4. Course Content of Drug Design

Week number	Lecture contents (4hrs/week)
1	Principles of drug design
2	Combinatorial chemistry (combinatorial and parallel synthesis in medicinal chemistry projects)
3	Combinatorial chemistry (solid phase techniques)
4	QSAR (hydrophobicity, electronic effects)
5	QSAR(steric factors, other physicochemical parameters)
6	**Activity(Reports)**
7	Drug design and relationship of functional groups to biological activity (hydrophilic/ hydrophobic properties)
8	Drug design and relationship of functional groups to biological activity (resistance to chemical and enzymatic degradation)
9	Relationship between molecular structure and biological activity
10	Docking (Introduction)
11	Docking (procedures)
12	**Activity(Reports)**
13	Applications of drug design (self destruct drugs, peptidomimetics)
14	Applications of drug design (targeting drugs) and Revision & Open Discussion
15	**Final exam**

5- Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussions

6- Student Assessment methods:

Written exams to assess: a1,a2,a3&b1

Oral exams to asses: a1,a2,a3&b1

Activities to asses: d1

Assessment schedule:

Assessment (1): Activity	Week 6-12
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%**

Facilities required for teaching and learning:

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

7- References and books:

A-Scientific papers

B- Essential books:

i- Burger's medicinal chemistry and drug discovery

Edited by Manfred E.wolff

ii- Computer-aided molecular design

Application of Agrochemicals, Materials & pharmaceuticals

Edited by Charles H.Reynolds,M.Katharine Holloway and Harold K.COX(2003)

C- Suggested books:

i- The organic chemistry of drug design and drug action, second edition, Edited by Richard B.Silverman.(2005)

ii- Designing Bioactive molecules

Three dimensional Techniques and applications, Edited by Yvonne C.Martin and Peter Willett. (2009)

iii- Drug Design: Structure- and Ligand-Based Approaches by Kenneth M. Merz, Dagmar Ringe and Charles H. Reynolds (May 31, 2010)

iv- ORGANIC CHEMISTRY OF DRUG DESIGN AND DRUG ACTION , 2ND EDITION (2012)

D- Websites:

http://www.ncbi.nlm.nih.gov/sites/entrez

http://journals.tubitak.gov.tr/chem/index.php

http://www.pharmacopoeia.co.uk/

www.Pubmed.Com

www.sciencedirect.com

www.amazon.com

www.ekb.eg

- **Course lecturers: Prof.Dr/Mohammed Al-hussany.**
  Prof.Dr/ Mohamed Baraka.
  Prof.Dr/ Kamel Metwally
- **Course Coordinators: Prof.Dr/Mohammed Al-hussany.**
- **Head of Department: Prof.Dr/ Kamel A. Metwally**

- **Date:** **تم اعتماد التوصيف بتاريخ**

Matrix I of Drug Design (2019)

	Course Contents	ILOs of Drug Design course				
		Knowledge and understanding			Intellectual skills	General and Transferable skills
		a1	**a2**	**a3**	**b1**	**d1**
1	Principles of drug design	x				
2	Combinatorial chemistry (combinatorial and parallel synthesis in medicinal chemistry projects)	x				
3	Combinatorial chemistry (solid phase techniques)	x				
4	QSAR (hydrophobicity, electronic effects)		x			
5	QSAR(steric factors, other physicochemical parameters)		x			
6	**Activity(Reports)**					x
7	Drug design and relationship of functional groups to biological activity (hydrophilic/ hydrophobic properties)		x	X		
8	Drug design and relationship of functional groups to biological activity (resistance to chemical and enzymatic degradation)		x	X		
9	Relationship between molecular structure and biological activity		x	X		
10	Docking (Introduction)			X		
11	Docking (procedures)			X		
12	**Activity(Reports)**					X
13	Applications of drug design (self destruct drugs, peptidomimetics)				x	
14	Applications of drug design (targeting drugs)& Revision & Open Discussion	x	x	X	**X**	x
15	**Final Exam**	x	x	X	x	

Matrix II of Drug Design (2019)

NARS		Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods		Methods of assessment		
						Lecture	Self learning	Written exam	Oral exam	Activities
2.1	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A.1- Outline the concepts associated with medicinal chemistry and related subjects including: Drug design, Instrumental Analysis & chromatography, Physical chemistry, analysis of drugs and quality control as well as Drug Stability.	a1	Principles of drug design. Combinatorial chemistry	Textbooks, Scientific papers and self learning	X	x	x	x	

	2.1.2- Mutual influence between professional practice and its impact on the environment.	A.2- Identify the applications of theories in developing molecules and drug design that serves the community and the patients.	a2	QSAR Drug design and relationship of functional groups to biological activity. Relatioship between molecular structure and biological activity.	Textbooks, Scientific papers and self learning	X	x	x	x	
	2.1.3- Scientific developments in the area of specialization.	A.3- Record the recent advances in the field of medicinal chemistry & their related subjects including computer-aided drug design , validation parameters in drug analysis& Advanced medicinal chemistry.	a3	Drug design and relationship of functional groups to biological activity. Relationship between molecular structure and biological activity. Docking Activity	Textbooks, Scientific papers and self learning	X	x	x	x	
2.2	2.2.3-Correlate and integrate different pharmaceutical knowledge to solve professional problems.	B.3- Solve professional problems related to drug design and drug synthesis.	b1	Applications of drug design.	Textbooks, Scientific papers and self learning	X	x	x	x	

2.4	2.4.2- Effectively use information technology in professional practices	D.2- Demonstrate appropriate information technology skills especially in the areas of word processing, internet communication, information retrieval and online literature searching.	d1	Activity (Reports)	Internet Textbooks		x			x

Good practice for analysis of drugs and quality control

2019

Course specification of Good practice for analysis of drugs and quality control

Course specifications:

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

1- Basic information:

Title: **Quality in Instrumental Analysis and Quality Control**

Code: ME3

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 choose & develop suitable analytical methodology and find an effective solution for a given complex problem.

3. Intended learning outcome s (ILOs) of Good practice for analysis of drugs and quality control

Knowledge and Understanding	
a1	Outline the new aspects in drug analysis & quality control
a2	Express up-to-date information in the field of drug analysis
a3	Illustrate the applications of quality control & quality assurance
Intellectual skills	
b1	Analyze & evaluate obtained results qualitatively & quantitatively
b2	Evaluate GMP to avoid any hazards
General and Transferable Skills	
d1	Improve professional abilities by evaluation of information from different sources.
d2	Write reports and present it.

4. Course Content :

Week number	Lecture contents (4hrs/week)
1	Validation parameters in analysis
2	Application of quantitative analysis for different drugs.
3	Quality control and how to minimize the synthesis errors.
4	Quality assurance and basic requirement.
5	Applications of Spectrophotometric analysis for dosage forms **Activity**
6	H^1,C^{13},N^{15},F^{19}- NMR
7	Advanced techniques in mass spectroscopy
8	Atomic absorption
9	Fluorimetric analysis

10	Radioimmune Assaym
11	Electrophoresis
12	Advanced GC-MS chemistry **Activity**
13	Spectrodenistometric (TLC scanner)
14	Forensic chemistry & Revision & Open Discussion
15	Final written & oral exam

5- Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion

6- Student Assessment methods:

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

Assessment schedule:

Assessment (1): Activity	Week 5-12
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:

Halpern,A in "Experimental physical chemistry"(2007)

Oxtoby,D and Nachtrieb, N in "Principles of Modern chemistry"(2009)

C- Suggested books:

Garfied, F .M., Klesta ,E and Hirsch, J in" Quality Assurance Principles for Analytical Laboratories"(2011)

D- Websites:

http://www.ncbi.nlm.nih.gov/sites/entrez

http://journals.tubitak.gov.tr/chem/index.php

http://www.pharmacopoeia.co.uk/

www.Pubmed.Com

www.sciencedirect.com

www.amazon.com

www.ekb.eg

Facilities required for teaching and learning:

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

- **Course lecturers:**

  Prof.Dr/ Abdalla Alsahanawany

  Dr. Mahmoud Sebeiy

- **Course Coordinators: Prof.Dr/ Abdalla Alsahanawany**
- **Head of Department: Prof.Dr/ Kamel A. Metwally**
- **Date: تم اعتماد توصيف المقرر بمجلس القسم بتاريخ**

Matrix I of Good practice for analysis of drugs and quality control

Course Contents		ILOs of Quality in Instrumental Analysis and Quality Control course						
		Knowledge and understanding			Intellectual skills		General and Transferable skills	
		a1	a2	a 3	b1	b 2	d1	d 2
1	Validation parameters in analysis	x		X				
2	Application of quantitative analysis for different drugs.	x	x	X				
3	Quality control and how to minimize the systemic errors.	x		X	x			
4	Quality assurance and basic requirements of GMP	x		X				
5	Application of Spectrophotometric analysis(UV-VIS-IR) **Activity**		x		x	X	x	X
6	H^{1},C^{13},N^{15},F^{19}- NMR	x	x			X		
7	Advanced techniques in mass spectroscopy		x			X		
8	Atomic absorption			X		X		
9	Fluorimetric analysis		x			X		
10	Radioimmune Assay		x					
11	Electrophoresis		x					
12	Advanced GS-MS chemistry. **Activity**	x		X			x	X
13	Spectrodenistometric (TLC scanner)	x		X	x			
14	Forensic chemistry & Revision & Open Discussion	x	x	x	x	X	x	X

	Final written & oral exam	x	x	x	x	X		

Matrix II of Good practice for analysis of drugs and quality control

NARS		Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods		Method of assessment		
						Lecture	Self learning	Written exam	Oral exam	Activities
2.1	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A.1- Outline the concepts associated with medicinal chemistry and related subjects including: Drug design, Instrumental Analysis & chromatography, Physical chemistry, analysis of drugs and quality control as well as Drug Stability.	a1	Validation parameters in analysis Application of quantitative analysis for different drugs H^{1},C^{13},N^{15},F^{19}- NMR Forensic chemistry Spectrodenistometric (TLC scanner) Advanced GC-MS Techniques	Textbooks, Scientific papers and self learning	X	x	X	X	

	2.1.3- Scientific developments in the area of specialization	A.3- Record the recent advances in the field of medicinal chemistry & their related subjects including computer-aided drug design , validation parameters in drug analysis& Advanced medicinal chemistry.	a2	Application of quantitative analysis for different drugs Applications of Spectrophotometric analysis for dosage forms H1,C13,N15,F19 NMR Advanced techniques in mass spectroscopy Fluorimetric analysis Radioimmune Assay Electrophoresis Forensic chemistry	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.5- Identify the principles to ensure quality in the wide field of medicinal chemistry.	a3	Spectrodenistometric (TLC scanner) Atomic absorption GC-MS Techniques Validation parameters in analysis Application of quantitative analysis Quality control and how to minimize systemic erros. Quality assurance and basic requirements of GMP	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 interpret data obtained from Instrumental analysis of different drugs .	b1	Quality control and how to minimize systemic error Applications of Spectrophotometric analysis for dosage forms Spectrodenistometric (TLC scanner)	Textbooks, Scientific papers and self learning	X	x	X	X	
	2.2.5- Evaluate and manage risks and potential hazards in professional practices in the area of specialization	B.5- Evaluate risks of the experiments and the techniques adopted in research and handle the chemicals safely.	b2	Applications of Spectrophotometric analysis for dosage forms Advanced techniques in mass spectroscopy Atomic absorption Fluorimetric analysis H^{1},C^{13},N^{15},F^{19}- NMR	Textbooks, Scientific papers and self learning	X	x	X	X	

2.4	2.4.2- Effectively use information technology in professional practices	D.2- Demonstrate appropriate information technology skills especially in the areas of word processing, internet communication, information retrieval and online literature searching.	d2	Activity (Reports)	Internet Textbooks		x			x
	2.4.4- Use variable sources to get information and knowledge.	D.4-Retreive information from a wide range of sources.	d1	Activity (Reports)	Internet Textbooks		x			X

Physical Chemistry

Course specification of Physical Chemistry

A- Course specifications:

- Program on which the course is given: Master's of Pharmaceutical Sciences in medicinal chemistry
- Major or Minor element of program: Major
- Department offering the program: Medicinal Chemistry.
- Department offering the course: Analytical Chemistry.
- Date of specification approval: 2019

1- Basic information:

Title: **Physical Chemistry** Code: M106

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 should be able to outline the principles of kinetics, catalysis, solutions and photochemistry and describe theories of reaction rate, types of chemical reaction criteria of catalysis.

3. Intended learning outcome s (ILOs) of Physical Chemistry:

A- Knowledge and Understanding	
a1	Describe the principles of kinetics, catalysis, solutions and photochemistry
a2	Outline the behavior and laws governing, photochemistry, solutions and chemical reactions and their applications.
a3	Describe units of measurements and calculations with chemical formulas and equations.
B- Intellectual skills	
b_1	Implement the knowledge and information obtained from physical chemistry principles in determining rates of the reaction.
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	Improve scientific brain storming capabilities of team members

4. Course Contents of Physical Chemistry:

Week number	Contents
1	• Introduction of kinetics and rate of reactions
2	• Molecular and order of reaction.
3	• Parallel and consecutive reactions.
4	• Methods used for determination of the order of reactions
5	• Theories of reaction rates and chain reaction
6	• Criteria of catalysis.
7	• Homogenous and enzyme catalysis

8	• Heterogeneous catalysis
9	• Nature of electrolytes in solution.
10	• Photochemistry and properties of electromagnetic radiations.
11	• Laws of photochemical process, quantum yield and chain reaction.
12	• Solutions: • Principles and concentration and solubility.
13	• Factors affecting solubility • Solute-solvent interaction. • Solubility and temperature. • Effect of pressure on solubility.
14	• Solutions of liquids in liquids • Solutions of solid in liquids (Colligative properties of solutions.)
15	• Written Exam

5- Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion
- Internet based search

6- Student Assessment methods :

Written exams to assess: a1, a2, a3 and b1

Oral exam to assess: a1, a2, b1 and b2

Activity to assess: d1, d2 and d3

Assessment schedule:

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

B- Essential books:

- Principles of Physical Chemistry (Part 1-2) by Lion el M. Raff, Prentice Hall; 1st edition (2001).
- Physical chemistry of surfaces, Arthur Ademson, John Wiley & Sons.inc:1st edition (2000).

D- Websites/Journal:

Analytical Chemistry

www.sciencedirect.com

www.rsc.org

Facilities required for teaching and learning:

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

- **Course Coordinator: Prof Dr/ Wafaa Hassan**
  Prof Dr/ Mervat Hosny
- **Head of Department:**

Matrix I of Physical Chemistry

	Course Contents	ILOs						
		Knowledge and understanding			Intellectual skills	General and Transferable skills		
		a1	a2	a3	b1	d_1	d_2	d_3
1	• Introduction of kinetics and rate of reactions	x						
2	• Molecular and order of reaction.			x				
3	• Parallel and consecutive reactions.			x	x			
4	• Methods used for determination of the order of reactions	x						
5	• Theories of reaction rates and chain reaction		x					
6	• Criteria of catalysis.		x					
7	• Homogenous and enzyme catalysis	x						

8	• Heterogeneous catalysis	**X**				**X**	**X**	**X**
9	• Nature of electrolytes in solution.	**X**						
10	• Photochemistry and properties of electromagnetic radiations.		**x**					
11	• Laws of photochemical process, quantum yield and chain reaction.		**x**					
12	• Solutions: • Principles and concentration and solubility.		**x**					
13	• Factors affecting solubility • Solute-solvent interaction. • Solubility and temperature. • Effect of pressure on solubility.		**x**					
14	• Solutions of liquids in liquids		**x**					

	• Solutions of solid in liquids (Colligative properties of solutions.)							

Matrix II of Physical Chemistry

NARS		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 the concepts associated with medicinal chemistry and related subjects including: Drug design, Instrumental Analysis & chromatography, Physical chemistry, analysis of drugs and quality control as well as Drug Stability.	a1	• Introduction of kinetics and rate of reactions. • Methods used for determination of the order of reactions • Homogenous and enzyme catalysis • Heterogeneous catalysis • Nature of electrolytes in solution.	Textbooks, Scientific papers and self learning	x	X	x	x	
			a2 a3	• Theories of reaction rates and chain reaction • Criteria of catalysis. Photochemistry and properties of electromagnetic radiations. • Laws of photochemical process, quantum yield and chain reaction. Solutions:						

				• Principles and concentration and solubility. Factors affecting solubility • Solute-solvent interaction. • Solubility and temperature. • Effect of pressure on solubility. • Solutions of liquids in liquids • Solutions of solid in liquids (Colligative properties of solutions.)						
2.2	2.2.1- Analyze and evaluate information in the field of specialization and analogies to solve problems	B.1- Analyze and interpret data obtained from Instrumental analysis of different drugs .	b1	Units of measurements and dimensional analysis---Calculations with chemical formulas and equations.	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- Solve professional problems related to drug design and drug synthesis.								
2.4	**2.4.2- Effectively use information technology in professional practices**	D.2- Demonstrate appropriate information technology skills especially in the areas of word processing, internet communication, information retrieval and online literature searching.	d1	Activity						X
	2.4.6- Work in a team and lead teams carrying out various	D.6- Work effectively in a group environment.	d2	Activity						x

	professional tasks.		d3							x

Advanced Instrumental Analysis & chromatography I

Course specification of Advanced Instrumental Analysis & chromatography I

Course specifications:

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

1- Basic information:

Title: **Advanced Instrumental Analysis & chromatography I**

Code: M101

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 demonstrate fundamental knowledge and basic theories in instrumental analysis, the concepts of diagnosing cardiac diseases, G.I.T diseases and infections through IR, HNMR and UV spectrophotometry **as well as** new aspects of (HPLC), HPLC/Mass, Gas Chromatography (GC) and GC/Mass and their medicinal applications.

3. Intended learning outcomes (ILOs) of Advanced Instrumental Analysis & chromatography I

Knowledge and Understanding	
a1	Illustrate theories for separation of different components in combined therapy and their determination quantitatively using different instrumental techniques.
a2	State medicinal and pharmaceutical applications of spectroscopy , HPLC and GC
Intellectual skills	
b1	Analyze & interpret qualitative & quantitative data obtained from instrumental analysis
General and Transferable skills	
d1	Write reports and present it.

4. Course Content of Advanced Instrumental Analysis & chromatography I:

Week number	Lecture contents (4hrs/week)
1	Advanced Ultra-violet spectroscopy
2	New aspects in vibrational spectroscopy (IR spectroscopy)
3	Application of Nuclear magnetic resonance (NMR)
4	Application of Mass spectrometry(MS)
5	Medicinal application of spectroscopy in diagnosis of diseases
6	Raman spectroscopy.
7	Advanced HPLC. **Activity (Reports)**

8	HPLC & its medicinal and pharmaceutical application
9	High performance thin layer chromatography (HPTLC).
10	Advanced Gas chromatography.
11	GC & its medicinal and pharmaceutical application
12	New aspects of Supercritical fluid chromatography (SFC) and ion exchange chromatography (IEC).
13	Capillary electrophoresis(CE)
14	Analytical application of dimeric and polymeric molecules. **Activity (Reports)**
15	Written exam

5- Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion

6- Student Assessment methods:

Written exams to assess: a1,a2&b1

Oral exams to assess: a1,a2&b1

Activities to asses: b1&d1

Assessment schedule:

Assessment (1): Activity	Week 7-14
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

B- Essential books:

-Chemical stability of pharmaceuticals, Kenneth A. Connors, Kenneth Antonio Connors, Gordon L. Amidon, Valentino J. Stella

-Pharmaceutical process validation Robert A. Nash, Alfred H. Wachter (2006)

C- Suggested books:

-Photostability of drugs and drug formulations, Hanne Hjorth Tønnesen (2004)

-U.S.P. & B.P (2010)

D- Websites:

http://www.ncbi.nlm.nih.gov/sites/entrez

http://journals.tubitak.gov.tr/chem/index.php

http://www.pharmacopoeia.co.uk/

www.Pubmed.Com

www.sciencedirect.com

Facilities required for teaching and learning:

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

- **Head of Department:**
- **Date:** تم اعتماد التوصيف بمجلس القسم بتاريخ

Matrix I of Advanced Instrumental Analysis & chromatography I

Course Contents		ILOs of Advanced Instrumental Analysis & chromatography I course			
		Knowledge and understanding		Intellectual skills	General and Transferable skills
		a1	a2	b1	d1
1	Advanced Ultra-violet spectroscopy	x	x	X	
2	New aspects of Vibrational spectroscopy (IR spectroscopy)	x	x	X	
3	Application of Nuclear magnetic resonance (NMR)	x	x	X	
4	Application of Mass spectrometry(MS)	x	x	X	
5	Medicinal application of spectroscopy in diagnosis of diseases		x	X	
6	Raman spectroscopy.	x			
7	Advanced HPLC. **Activity (Reports)**	x		X	X
8	HPLC & its medicinal and pharmaceutical application		x		
9	High performance thin layer chromatography (HPTLC)	x		X	
10	Advanced Gas chromatography	x			
11	GC & its medicinal and pharmaceutical application		x	X	
12	New aspects of Supercritical fluid chromatography (SFC) and ion exchange chromatography (IEC)	x	x		
13	Capillary electrophoresis(CE)	x	x		
14	Analytical application of dimeric and polymeric molecules. **Activity (Reports)**		x	X	x
15	Revision and open discussion	x	x	X	

Matrix II of Advanced Instrumental Analysis & chromatography I

NARS		Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods		Method of assessment		
						Lecture	Self learning	Written exam	Oral exam	Activities
2.1	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A.1- Outline the concepts associated with medicinal chemistry and related subjects including: Drug design, Instrumental Analysis & chromatography, Physical chemistry, analysis of drugs and quality control	a1	Advanced Ultra-violet spectroscopy New aspects of Vibrational spectroscopy (IR spectroscopy) Application of Nuclear magnetic resonance (NMR) Application of Mass spectrometry(MS) Raman spectroscopy Advanced HPLC High performance liguid chromatography HPTLC Advanced Gas chromatography New aspects of Supercritical	Textbooks, Scientific papers and self learning	X	x	X	X	

		as well as Drug Stability.		fluid chromatography (SFC) Capillary electrophoresis(CE)						
	2.1.3- Scintific development in the area of specialization	A.3- Record the recent advances in the field of medicinal chemistry & their related subjects including computer-aided drug design , validation parameters in drug analysis& Advanced medicinal chemistry.	a2	Advanced Ultra-violet spectroscopy New aspects of Vibrational spectroscopy (IR spectroscopy) Application of Nuclear magnetic resonance (NMR) Application of Mass spectrometry(MS) Medicinal application of spectroscopy in diagnosis of diseases Advanced HPLC & its medicinal and pharmaceutical application Advanced GC & its medicinal and pharmaceutical application New aspects of Supercritical fluid chromatography (SFC) Capillary electrophoresis(CE) Analytical application of dimeric and polymeric molecules.	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 interpret data obtained from Instrumental analysis of different drugs .	b1	Advanced Ultra-violet spectroscopy New aspects of Vibrational spectroscopy (IR spectroscopy) Application of Nuclear magnetic resonance (NMR) Application of Mass spectrometry(MS) Medicinal application of spectroscopy in diagnosis of diseases Advanced HPLC & its medicinal and pharmaceutical application Advanced GC & its medicinal and pharmaceutical application	Textbooks, Scientific papers and self learning	X	x	X	X	
2.4	2.4.2- Effectively use information technology in professional learning needs	D.2- Demonstrate appropriate information technology skills especially in the areas of word processing, internet communication, information retrieval and online literature searching.	d1	Activity (Reports)	Internet Textbooks		x			x

Drug Stability

Course specification of Drug stability

Course specifications:

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

1- Basic information:

Title: **Drug stability** Code: ME2
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 the degradation of drugs and the methods to determine the order of reaction, illustrate the stability programs for pharmaceutical products and the latest regulations for stability testing and ability to predict the degradation pathways of a drug design a stabilization protocol and predict a product shelf-life and discuss regulations and methodologies for drug stability program.

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

Knowledge and Understanding	
a1	Illustrate the principles drug stability
a2	Describe the regulations for drug stability program
a3	Describe the methodologies for drug stability program
Intellectual skills	
b1	Suggest suitable stability methods for drugs in the various dosage forms.
b2	Design in a self-directed and original research investigations on drug stability in dosage forms from degradation pathways
General and Transferable skills	
d1	Use computer skills to present information
d2	Collect information from a variety of sources

4. Course Content of Drug stability:

Week number	Lecture content (4 hr/w)
1	• Drug stability (Overview – importance)
2	• Stability regulations (overview)
3	• Critical regulatory requirements for a stability program
4	• Global stability practices
5	• Understanding and predicting pharmaceutical product shelf life
6	• Stability methodologies (overview)
7	• Development of stability indicating methods • **(Presentation)**
8	• Overview of USP-NF requirements for stability
9	• Non chromatographic methods for stability program
10	• Vibrational spectroscopic methods for quantitative analysis
11	• Evaluation of stability data
12	• Qualification, calibration and maintenance of stability chambers
13	• **Stability operation practices**
14	• Stability studies in biologics • **(Final Presentation)**
15	• Written exam

5- Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion
- Problem solving

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 7-15
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- Essential books: Drug Stability: Principles and Practices (Drugs and the Pharmaceutical Sciences) by Jens T. Carstensen and Christopher Rhodes (2000).

B- Suggested books:

1- Handbook of Stability Testing in Pharmaceutical Development: Regulations, Methodologies, and Best Practices, Kim Huynh-Ba, 389 (2008).
2- Extended Stability for Parenteral Drugs, 5th Edition (Extended Stability of Parenteral Drugs), Fifth Edition, Caryn Dellamorte Bing R.PH. M.S. FASHP and Anna Nowobilski-Vasilios , American Society of Health-System Pharmacists; (2013)

C- Websites: Pubmed, Sciencedirect, Weilyinterscience

Facilities required for teaching and learning:

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

- **Course Coordinators:**
- **Head of Department:**
- **Date:** تم اعتماد التوصيف بمجلس القسم

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	Drug stability (Overview – importance)	X						
2	Stability regulations (overview)		x					
3	Critical regulatory requirements for a stability program		x					
4	Global stability practices		x					
5	Understanding and predicting pharmaceutical product shelf life		x			x		
6	Stability methodologies (overview)			x				
7	Development of stability indicating methods **(Presentation)**			x			x	x
8	Overview of USP-NF requirements for stability			x				
9	Non chromatographic methods for stability program			x	x			
10	Vibrational spectroscopic methods for quantitative analysis			x	x			
11	Evaluation of stability data			x	x			
12	Qualification, calibration and maintenance of stability chambers			x				
13	Stability operation practices			x				
14	Stability studies in biologics			x				
15	Open discussion **(Final Presentation)**	x	x	x	x	x	X	x

Matrix II of Drug stability

NARS		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 the concepts associated with medicinal chemistry and related subjects including: Drug design, Instrumental Analysis & chromatography, Physical chemistry, analysis of drugs and quality control as well as Drug Stability.	a1	Drug stability (Overview – importance)	Textbooks, Scientific papers and self learning	x	xx	x	x	
			a2	Stability regulations (overview) Critical regulatory requirements for a stability program Global stability practices Understanding and predicting pharmaceutical product shelf life	Textbooks, Scientific papers and self learning	x	x	X	x	
			a3	Stability methodologies (overview) Development of stability indicating methods Overview of USP-NF requirements for stability	Textbooks, Scientific papers and self learning	x	X	X	x	

				Non chromatographic methods for stability program Vibrational spectroscopic methods for quantitative analysis Evaluation of stability data Qualification, calibration and maintenance of stability chambers Qualification, calibration and maintenance of stability chambers Stability operation practices Stability studies in biologics						
	2.2.2- Solve specified problems in the lack or missing of some information.	. B.2- Solve different practice problems even if there is lack of information.	b1	Understanding and predicting pharmaceutical product shelf life	Textbooks, Scientific papers and self learning	x	x	x	x	

	2.2.6- Plan to improve performance in the field of specialization	B.6- Plan a research project including problems definition and taking professional decisions	b2	Non chromatographic methods for stability program Vibrational spectroscopic methods for quantitative analysis Evaluation of stability data	Textbooks, Scientific papers and self learning	x	x	x	x	
2.4	2.4.2- Effectively use information technology in professional practices	D.2- Demonstrate appropriate information technology skills especially in the areas of word processing, internet communication, information retrieval and online literature searching.	d1	Activity	Textbooks, Scientific papers and self learning		x			**X**
	2.4.4- Use variable sources to get information and knowledge.	D.4-Retreive information from a wide range of sources	d2	Activity	Textbooks, Scientific papers and self learning		x			**x**

Special Courses

Computer Aided Drug Design

2019

Course specification of Computer Aided Drug Design

Course specifications:

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

1- Basic information:

Title: **Computer Aided-Drug Design** Code: Msp1
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 demonstrate computer-aided tools in drug design and find a starting point for a laboratory synthesis

3. Intended learning outcome s (ILOs) of computer aided-drug design

Knowledge and Understanding	
a1	outline the principles of CADD (computer aided drug design)
a2	Describe up-to-date information in computer aided drug design
Intellectual skills	
b1	Take professional decision in drug design with the aid of computer.
General and Transferable Skills	
d1	Improve professional abilities by evaluation of information from different sources.
d2	Write reports and present it.

4. Course Content of Computer aided drug design

Week number	Lecture contents (4hrs/week)
1	History of Computer Aided Drug Design (CADD)
2	Types of Drug Design • Ligand based • Structure based
3	Structure based drug design
4	Protein based drug design
5	Computational chemistry (molecular properties)
6	Computational chemistry (conformational analysis)
7	**Activity**
8	Relation between CADD and Combinatorial Chemistry
9	Virtual Screening and machine learning
10	Molecular De- Novo design (principles)
11	Molecular De- Novo design (Automated de novo design)
12	Drug target profiling and Polypharmacology
13	**Activity**
14	Fields of computational chemistry applications
15	Written Exam

5- Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion

6- Student Assessment methods:

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

Assessment schedule:

Assessment (1): Activity	Week 7-13
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%**

Facilities required for teaching and learning

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

7- References and books:

A-Scientific papers

B- Essential books:

- The organic chemistry of drug design and drug action , Edited by Richard B.Silverman.(2010)

- Designing Bioactive molecules Three dimensional Techniques and applications , Edited by Yvonne C.Martin and Peter Willett.(2008)

C- Suggested books:

- Computer modeling of enzyme catalysed reaction mechanisms. A.J. Mulholland, G.H. Grant and W.G. Richards. ***Protein Eng.*** 6, 133 (1993).
- Similarity of molecular **shape.** A.Y. Meyer and W.G. Richards. ***J. Comput. Aided Mol. Design*** 5,427
- Rapid evaluation of **shape** similarity using gaussian functions. A.C. Good and W.G. Richards. J.***Chem.*** *Znfi* ***Comput. Sci.*** 33, 112
- Utilization of Gaussian functions for the rapid evaluation of molecular similarity. A.C. Good, E.E. Hodgkin and W.G. Richards. ***J. Chem.*** *Zn$* ***Comput. Sci.*** 32,188.
- A linear molecular similarity index. C.A. Reynolds, C. Burt and W.G. Richards. ***Quant. Struct. Act. Relat.*** 11, 34.
- Structure-activity relationships from molecular **si.milarity** matrices. A.C. Good, Sung-Sau **So** and W.G. Richards. ***J. Med. Chem.*** 36,433.

-Computer-Aided Drug Design and Delivery Systems by Ahindra Nag and Baishakhi Dey (Aug 12, 2010)

- **Drug Design: Structure- and Ligand-Based Approaches** by Kenneth M. Merz, Dagmar Ringe and Charles H. Reynolds (May 31, 2010)

D- Websites:

http://www.ncbi.nlm.nih.gov/sites/entrez

http://journals.tubitak.gov.tr/chem/index.php

http://www.pharmacopoeia.co.uk/

www.Pubmed.Com

www.sciencedirect.com

www.amazon.com

Facilities required for teaching and learning:

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

- **Course lecturers: Prof. Dr/sobhy Eladl**
  Prof. Dr/ Samy Megahed

Dr. Hend Kothayer

- **Course Coordinators: Prof. Dr/ samy megahed ibramin**
- **Head of Department: Prof.Dr/ Kamel A. Metwally**
- **Date:** تم اعتماد التوصيف بمجلس القسم بتاريخ

Matrix I of Computer-Aided Drug Design

Course Contents		ILOs of Computer-Aided Drug Design course				
		Knowledge and understanding		Intellectual skills	General and Transferable Skills	
		a1	**a2**	**b1**	**d1**	**d2**
1	History of Computer Aided Drug Design (CADD)	X				
2	Types of Drug Design • Ligand based • Structure based	X				
3	Structure based drug design	X	x			
4	Protein based drug design	X	x			
5	Computational chemistry (molecular properties)	X	x			
6	Computational chemistry (conformational analysis)	X	x			
7	**Activity**				X	x
8	Relation between CADD and Combinatorial Chemistry		x			
9	Virtual Screening and machine learning		x			
10	Molecular De- Novo design (principles)		x			
11	Molecular De- Novo design (Automated de novo design)		x			
12	Drug target profiling and Polypharmacology		x			
13	**Activity**				x	x
14	Fields of computational chemistry applications		x	x		
15	Final exams	X	x	x		

Matrix II of Computer-Aided Drug Design

NARS		Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods		Method of assessment		
						Lecture	Self learning	Written exam	Oral exam	Activities
2.1	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A.1- Outline the concepts associated with medicinal chemistry and related subjects including: Drug design, Instrumental Analysis & chromatography, Physical chemistry, analysis	a1	• History of Computer based drug design (CADD) • Types of Drug Design • Ligand based • Structure based	Textbooks, Scientific papers and self learning	X	x	x	x	

		of drugs and quality control as well as Drug Stability.		• Computational chemistry • Structure based drug design • Protein based drug design • Revision and open discussion							

	2.1.3- Scientific developments in the area of specialization.	A.3- Record the recent advances in the field of medicinal chemistry & their related subjects including computer-aided drug design , validation parameters in drug analysis& Advanced medicinal chemistry.	a2	• Computational chemistry • Structure based drug design • Protein based drug design • Relation between CADD and Combinatorial Chemistry • Virtual Screening and machine learning • Molecular De- Novo design • Drug target profiling and Polypharmacology • Fields of computational chemistry applications • Revision & open discussion	Textbooks, Scientific papers and self learning	x	x	x	x	
2.2	2.2.3- Correlate and integrate different pharmaceutical knowledge to solve professional problems.	B.3- Solve professional problems related to drug design and drug synthesis.	b1	Fields of computational chemistry applications	Textbooks, Scientific papers and self learning	x	x	x	x	

2.4	2.4.2- Effectively use information technology in professional practices	D.2- Demonstrate appropriate information technology skills especially in the areas of word processing, internet communication, information retrieval and online literature searching.	d1	Reports	Reports		x			x
	2.4.4- Use variable sources to get information and knowledge.	D.4-Retreive information from a wide range of sources.	d2	Reports	Reports		X			x

Validation Parameters in Drug Analysis

Course specification of Validation Parameters in Drug Analysis

Course specifications:

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

1- Basic information:

Title: **Validation Parameters in Drug Analysis**
Code: Msp2
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 choose more specific suitable analytical methodology, analyze & find an effective solution for a given complex problem.

3. Intended learning outcomes (ILOs) of Validation Parameters in Drug Analysis

Knowledge and Understanding	
a1	Outline in depth the principles of drug analysis
a2	Identify recent information & methods in drug analysis
a3	Describe the essentials for GLP & Q.A in the field of drug analysis
Intellectual skills	
b1	Analyze quantitative data obtained from drug analysis
b2	Choose & develop suitable specific analytical methodology
General and Transferable skills	
d1	Improve professional abilities by evaluation information from different sources.
d2	Write reports and present it.

4. Course Content of Validation Parameters in drug analysis :

Week number	Lecture contents (4hrs/week)
1	Sampling
2	Examples of experimental errors
3	Choice of specific methods of analysis Statistic of data analysis
4	Application of validation parameters of analytical procedures (specificity , linearity , range)
5	Application of validation parameters of analytical procedures (accuracy , precision , detection limit , quantitation limit)
6	Application validation parameters of analytical procedures

	(robustness , ruggedness , system suitability test) **Activity**
7	Drug stability & stability indicating assay
8	Radio-chemical purity & its control
9	Application of functional group analysis Classical analysis
10	Application of functional group analysis instrumental analysis
11	Automation in pharmaceutical analysis Gas spectroscopy Mass spectroscopy Flow injection analysis
12	Automation in pharmaceutical analysis HPLC chromatography with mass detection GC chromatography
13	Examples of determination of active ingredients in different dosage forms in presence of degradation products. **Activity**
14	Examples of determination of active ingredients in different dosage forms
15	Written 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 exams to assess: a1, a2, a3, b1&b2
Activities to assess: d1&d2

Assessment schedule:

Assessment (1): Activity	Week 6-13
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:
Halpern,A in "Experimental physical chemistry"(2007)
Oxtoby,D and Nachtrieb, N in "Principles of Modern chemistry"(2011)

C- Suggested books:
Garfied, F .M., Klesta ,E and Hirsch, J in" Quality Assurance Principles for Analytical Laboratories"(2009)

D- Websites:

http://www.ncbi.nlm.nih.gov/sites/entrez

http://journals.tubitak.gov.tr/chem/index.php

http://www.pharmacopoeia.co.uk/

www.Pubmed.Com

www.sciencedirect.com

Facilities required for teaching and learning:

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

- **Course Coordinator: Prof. Dr/ Lobna Mohammed**
- **Head of Department: Prof.Dr/ Kamel A. Metwally**
- **Date:** تم اعتماد التوصيف بمجلس القسم بتاريخ

Matrix I of Validation Parameters in drug analysis

Course Contents		ILOs of Validation Parameters in drug analysis course						
		Knowledge and understanding			Intellectual skills		General and Transferable skills	
		a1	a2	a3	b1	b2	d1	d2
1	Sampling	x						
2	Examples of experimental errors	x						
3	Choice methods of specific methods of analysis Statistic of data analysis	x	x		X			
4	Application of validation parameters of analytical procedures (specificity , linearity , range)		x	x				
5	Application of validation parameters of analytical procedures (accuracy , precision , detection limit , quantitation limit)		x	x				
6	Application of validation parameters of analytical procedures (robustness , ruggedness , system suitability test) **Activity**		x	x			x	x
7	Drug stability & stability indicating assay			x				
8	Radio-chemical purity & its control	x						
9	Application of functional group analysis Classical analysis			x				
10	Application of functional group analysis instrumental analysis			x				
11	Automation in pharmaceutical analysis	x	x	x				

	Gas spectroscopy Mass spectroscopy Flow injection analysis							
12	Automation in pharmaceutical analysis HPLC chromatography with mass spectroscopic detection GC chromatography	x	x	x				
13	Examples of determination of active ingredients in different dosage forms **Activity**					x	x	x
14	Examples of determination of active ingredients in different dosage forms					x		
15	Final Exam	x	x	x	X	x		

Matrix II of Validation Parameters in drug analysis

NARS		Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods		Method of assessment		
						Lecture	Self learning	Written exam	Oral exam	Activities
2.1	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A.1- Outline the concepts associated with medicinal chemistry and related subjects including: Drug design, Instrumental Analysis & chromatography, Physical chemistry, analysis of drugs and quality control as well as Drug Stability.	a1	Sampling Experimental errors Choiceof specific methods of analysis Statistic of data analysis chemical purity & its control Automation in pharmaceutical analysis	Textbooks, Scientific papers and self learning	x	x	X	X	

	2.1.3- Scientific developments in the area of specialization.	A.3- Record the recent advances in the field of medicinal chemistry & their related subjects including computer-aided drug design , validation parameters in drug analysis& Advanced medicinal chemistry.	a2	Choice of specific methods of analysis Application of validation parameters of analytical procedures Automation in pharmaceutical analysis	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.5- Identify the principles of quality assurance to ensure quality in the wide field of medicinal chemistry.	a3	Application of validation parameters of analytical procedures Drug stability & stability indicating assay Application of functional group analysis Automation in pharmaceutical analysis	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 interpret data obtained from Instrumental analysis of different drugs.	b1	Statistic of data analysis	Textbooks, Scientific papers and self learning	x	x	x	X	

	2.2.4- Conduct research and write scientific report on research specified topics	B.4- Choose the appropriate drug analysis technique and take the necessary precautions to achieve the analysis.	b2	Examples of determination of active ingredients in different dosage forms	Textbooks, Scientific papers and self learning	x	x	x	X	
2.4	2.4.2- Effectively use information technology in professional practices	D.2- Demonstrate appropriate information technology skills especially in the areas of word processing, internet communication, information retrieval and online literature searching.	d1	Activity	Internet					x
	2.4.4- Use variable sources to get information and knowledge.	D.4-Retreive information from a wide range of sources.	d2	Activity	Internet		x			x

Advanced Medicinal Chemistry

2019

Course specification of Advanced Medicinal Chemistry

Course specifications:

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

1- Basic information:

Title: **Advanced Medicinal Chemistry**
Code: Msp3
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 strategies of gene therapy and show specific information about anti-aging drugs and antisense drugs.

3. Intended learning outcomes (ILOs) of Advanced Medicinal Chemistry:

Knowledge and Understanding	
a1	outline the strategies of gene therapy, anti-aging drugs and antisense drugs
a2	Describe up-to-date information in gene therapy, anti-aging drugs and antisense drugs
Intellectual skills	
b1	Interpret and analyze data related in advanced medicinal chemistry
General and Transferable skills	
d1	Improve professional abilities by evaluation information from different sources.
d2	Write reports and present it.

4. Course Contents:

Week number	Lecture contents (4hrs/week)
1	Principles of gene therapy
2	Challenges in gene therapy :Gene therapy development
3	Strategies for gene therapy
4	Preventive gene therapy
5	Gene therapy: Clinical applications of gene therapy
6	**Activity(Presentation)**
7	Introduction about antisense :Antisense therapy drugs for treatment of cancer
8	Example antisense therapies Cytomegalovirus retinitis Hemorrhagic fever viruses
9	Example antisense therapies

	Cancer HIV/AIDS
10	Antiaging drugs
11	**Activity**
12	Antioxidants as Drugs against Aging
13	Antioxidant Drugs
14	Proposed strategies of life extension (Nanotechnology)
15	Written exam

5- Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion

6- Student Assessment methods:

- Written exams to assess: a1,a2&b1
- Oral exams to assess: a1,a2&b1
- Activities to assess: d1, d2

Assessment schedule:

Assessment (1): Activity	Week 6-11
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:
-Principles and Practice of Pharmaceutical medicine
(Andrew J., Lionel D. Edwards, Peter D. Stonier, Anthony W. Fox) (2012)
-Age-related Macular Degeneration Study
-Gene Therapy a Suspect in Leukemia-like disease
D- Websites:

http://www.ncbi.nlm.nih.gov/sites/entrez

http://journals.tubitak.gov.tr/chem/index.php

http://www.pharmacopoeia.co.uk/

www.Pubmed.Com

www.sciencedirect.com

Facilities required for teaching and learning:

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

- **Course Coordinator: Prof. Dr. Mohammed Baraka**
- **Head of Department: Prof.Dr/ Kamel A. Metwally**
- **Date: تم اعتماد التوصيف بمجلس القسم بتاريخ**

Matrix I of Advanced Medicinal Chemistry

Course Contents		ILOs Advanced Medicinal Chemistry course					
		Knowledge and understanding		Intellectual skills		General and Transferable skills	
		a1	a2	b1		d1	d2
1	Principles of gene therapy	x					
2	Challenges in gene therapy		x				
3	Gene therapy: Strategies for gene therapy		x				
4	Preventive gene theapy		x				
5	Gene therapy: Clinical applications of gene therapy			x			
6	Activity(Presentation)					x	x
7	Introduction about antisense :Antisense therapy drugs for treatment of cancer	x					
8	Example antisense therapies 1 Cytomegalovirus retinitis 2 Hemorrhagic fever viruses		x				
9	Example antisense therapies 3 Cancer 4 HIV/AIDS		x				
10	Antiaging drugs	x					
11	Activity(Presentation)					x	x
12	Antioxidants as drugs against Aging	x					
13	Antioxidant as drugs against Aging		x				
14	Proposed strategies of life extension (nanotechnology)		x				
15	Written exam	x	x	X			

Matrix II of Advanced Medicinal Chemistry

NARS		Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods		Method of assessment		
						Lecture	Self learning	Written exam	Oral exam	Activities
2.1	2.1.3- Scientific developments in the area of specialization.	A.3- Record the recent advances in the field of medicinal chemistry & their related subjects including computer-aided drug design , validation parameters in drug analysis& Advanced medicinal chemistry.	a1	Principles of gene therapy Introduction about antisense drugs Antiaging drugs	Textbooks, Scientific papers and self learning	X	x	x	x	

		.	a2	Challenges in gene therapy. Strategies for gene therapy. Preventive gene therapy. Examples of antisense therapy. Antioxidant drug .	Textbooks, Scientific papers and self learning	X	x	x	x	
2.2	2.2.2- Solve specified problems in the lack or missing of some information	B.2- Solve different practice problems even if there is lack of information.	b1	Clinical applications of gene therapy	Textbooks, Scientific papers and self learning	X	x	x	x	
2.4	2.4.2- Effectively use information technology in professional practices	D.2- Demonstrate appropriate information technology skills especially in the areas of word processing, internet communication, information retrieval and online literature searching.	d1	Activity	Internet					x
	2.4.4- Use variable sources to get	D.4-Retreive information from a wide range of sources.	d2	Activity	Internet		x			x

	information and knowledge.									

Thesis Specification

Thesis of Master Degree

Thesis specifications:

- **Program on which the course is given:** Master of Pharmaceutical sciences (Medicinal Chemistry)
- **Major or Minor element of program:** Major
- **Department offering the program:** Medicinal Chemistry
- **Department offering the thesis:** Medicinal Chemistry
- **Date of specification approval:** 2019

1- Basic information:

Title: Master Thesis in Medicinal Chemistry
Credit hours: 30 hrs

2- Overall aim of the thesis:

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

Design a robust study to answer the research question**,** identify and perform different techniques and methods used in the experimental work according to the designed protocol**,** collect all the data needed to answer the research question using the developed study design**,** analyze the results of the study in the light of prior knowledge and draw conclusions about the contribution to knowledge made by the study.

3- Intended learning outcome's (ILOs):

Knowledge and Understanding	
a1	Understand all required knowledge related to thesis work.
a2	Select the point of the thesis according to the problems present in the community.
a3	Be aware with recent techniques and developments that can be used during study.
a4	Understand any legal aspects related to the thesis work.
a5	Identify the principles to ensure quality in the wide field of medicinal chemistry.
a6	Perform tasks given ethically and with dedication.
Intellectual skills	
b1	Analyze and interpret the experimental data in a suitable form to solve the suggested problem.
b2	Predict solution to the problem in the light of available data.
b3	Integrate all required knowledge to solve problems that may rise during practical work.
b4	Conduct a research project and write scientific reports.
b5	Manage risks and hazards during practical work.
b6	Plan and undertake a practical and research project including accessing relevant literature and awareness of recent technical and theoretical advances which could be applied.
b7	Make decisions related to recent and future studies.
Professional and practical skills	
c1	Apply a wide range of synthetic and measurement techniques and develop appropriate practical skills within the workplace.
c2	Report the work in a written report.
c3	Asses used methods, tools and instruments in the research.
General and Transferable skills	
d1	Communicate effectively with professionals.
d2	Use information technology in review and thesis preparation.
d3	Evaluate the work and learning needs.
d4	Use various sources to get information about the subject understudy.

d5	Set rules for evaluation and judging others performance.
d6	Work effectively as a member of a team.
d7	Acquire time management skills.
d8	Study independently and plan research studies.

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 related to the problems of the community and surrounding environment. • 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 understudy. • Design the protocol including the steps of work following the suitable timetable. • Increase the awareness of the recent chemical and analytical techniques that will be used during practical work and determined by the protocol. • Integrate different knowledge (medicinal chemistry, organic chemistry, analytical chemistry ……..) to solve suggested problem. • Continuous evaluation to the thesis outcome according to the schedule.
2nd	• Identify different practical techniques and methods to assess chemical parameters related to the subject under study. • Operate scientific instruments according to instructions. • Evaluate and manage chemical hazards throughout the whole practical work.

	• Organize the experimental work according to the designed protocol (individual, parallel or sequential experiments). • Identify the essentials to good laboratory practice and quality assurance in the wide field of synthesis of a drug with a biological activity / analysis of drugs with different biological activities. • Understand any legal aspects related to the thesis work especially those related to dealing with chemicals. • Apply ethical recommendations in all aspects of scientific research e.g. citation, publication……..
3rd	• Collect raw data for the tested chemical parameters. • Interpret raw data to get valuable information. • Perform statistical analysis and chemical correlation 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. • 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. • Present the thesis in a written form • 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….)
- Open discussion

6- References:

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

Facilities required for:

- **For practical work:** Heaters with magnetic stirrer- UV lamp- Rotary evaporator- Ice machine- Infrared- 1HNMR- Mass Spectrometer- Vacuum pump-UV-VIS spectrophotometer-Water bath-PH meter- Spectrofluorimetry -HPLC

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

MSc. of Medicinal chemistry -																								
Program Courses		Program intended learning outcomes																						
		Knowledge and understanding					Intellectual skills						Professional and practical skills				General and transferable skills							
		A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	D1	D2	D3	D4	D5	D6	D7	D8
General courses	Drug design	x	x	x					x									x						
	Advanced Inst.Anal.& Chromatography	x		x			x											x						
	Physical chemistry	X					x		x									x				x		
	Good practice and quality control	x		x		x	x				x							x		x				
	Drug stability	x						x				x						x		x				
Special courses	Computer Aided Drug Design	x		x					x									x		x				
	Validation Parameters in Drug Analysis	x		x		x	x					x						x		x				
	Advanced Medicinal Chemistry			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

PhD Degree

Program Specification

Program Specification

A- Basic Information

1) **Program title:** PhD. Pharm. Sci Degree in **Medicinal Chemistry**
2) **Program type:** Single.
3) **Faculty/ University:** Faculty of Pharmacy, Zagazig University
4) **Department:** Medicinal Chemistry
5) **Teaching language:** English
6) **Coordinator:** Prof. Dr. Mohamed El- Husseiny
7) **Internal evaluator:**Lobna Mohammed abd-aziz
8) **External evaluator:**Prof.Dr.Samir El-moghasy
9) **Academic references:**
   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- PhD. Pharm. Sci Degree in Medicinal Chemistry was compared to PhD. Medicinal Chemistry provided by School of Pharmacy, University of Illinois at Chicago,USA
10) **Date of program specification approval:** 2019

B- Professional Information

1- Program aims:

The PhD program, Zagazig University (PSPZU) is a 3-5 five years pharmacy education offering a PHD degree in pharmaceutical sciences (Medicinal Chemistry). 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. Provide the community with highly qualified professionals in medicinal chemistry with skills and ethical values.
2. Acquire the advanced and in-depth knowledge and skills in areas related to Medicinal Chemistry, Drug Design and interpretation of data in Molecular Modeling.
3. Discover the principles of impurities analysis and those for confirming the structure and biological data in drug modeling.
4. Use the most contemporary techniques in ensuring Radio-Chemical purity, drug stability assays.
5-Achieve more innovative methods and tools in studying the topography of different receptors.
6- Employ information technology in the preparation and submission of a detailed literature review.
7-Contribute in developing knowledge and awareness of society.

1- Graduate attributes:

By the end of PhD programme, the graduate should be able to:

1- Master the principles and methods of scientific research in the field of Medicinal Chemistry.
2- Use effectively molecular modeling and docking programs.
3- Demonstrate knowledge about protein structure of drug biomolecular targets as well as molecular geometry and conformations.
4- Gain continuous access to the most recent information in the field of drug design and analysis.

5-Show problem solving, critical thinking, decision making and life-long learning skills .

6- Adhere to ethics of scientific research and scientific honesty.

7- Communicate efficiently with others.

8- Work effectively in a group with demonstration of leadership skills.

2-Intended Learning Outcomes (ILOs):

The program provides great opportunities for PhD students to demonstrate extraordinary in-depth knowledge, understanding and develop unusual skills appropriate for PhD in Medicinal Chemistry.

2-1- Knowledge and Understanding :

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

A.1- Demonstrate fundamental theoretical concepts and in-depth information of medicinal chemistry and impurities analysis.

A.2- outline theories and aspects of drug design, drug modeling.

A.3- Identify the possible mechanisms, techniques and theories present in papers.

A.4- outline the ethical and legal principles in academic practices.

A.5- list the principles and bases of quality assurance especially in pharmaceutical impurities in addition to drug design and modeling.

A.6- Identify the effect of the drug synthesis and analysis on the environment and society

A.7- Recall new advances in medicinal chemistry research areas

A8- Describe methods of handling with chemical hazards and waste disposal.

2-2 - Intellectual Skills:

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

B.1- Interpret data obtained from analysis of drug and impurities to use them in a suitable manner.

B.2- Evaluate obtained data during drug synthesis, drug design and their biological activity studies.

B.3- Analyze and solve chemistry based problems.

B.4- Explore new areas of research in various fields of chemistry and develop appropriate experimental design.

B.5- Write scientific papers on the obtained results from the research.

B.6- Recognize and avoid possible hazards during practical work.

B.7- Improve the performance by using new techniques and following a planned protocol to obtain new results.

B.8- Make effective decision in complex and unpredictable situations.

B.9- Introduce new ideas and applications in the field of impurities and drug synthesis.

B.10- Discuss results very carefully and reject errors.

2-3 - Professional and Practical Skills:

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

C.1- Perform standard laboratory procedures.

C.2- Write with confidence reliable scientific reports and papers in medicinal chemistry research.

C.3- Conduct various methods and chemical techniques of analysis and assure the quality and suitability of instruments.

C.4- Use available technologies either in software or instruments in the professional work.

C.5- Search for newest programs in data analysis and help other scholars to use.

2-4 - General and Transferable Skills:

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

D.1- Communicate clearly in oral, written and non verbal form.

D.2- Use professional softwares and computer skills to improve performance.

D.3- Evaluate other's achievement and help them to develop their performance.

D.4- Develop long learning skills and stay informed of the professional field.

D.5- Use a variety of resources to investigate topics of interest including libraries, databases and internet.

D.6- work effectively as a member of a team.

D.7- Get maximum use of time to achieve goals through hard work and attending scientific meetings.

3- Academic Standards:

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

Matrix1: Comparisons of graduate attributes of Medicinal chemistry Ph-D program with the Academic Reference Standard {ARS, 2009} developed by NAQAAE

Attributes of the graduates (ARS, 2009)	Attributes of the graduates (Ph-D Degree in Medicinal chemistry)
1.Apply the specialized knowledge he has acquired in his professional practice	1-Master the principles and methods of scientific research in the field of Medicinal Chemistry. 3-Demonstrate knowledge about protein structure of drug biomolecular targets, as well as molecular geometry and conformations.
2. Identify and solve professional problems 5. Take decisions using available information 9. Be a lifelong learner and able to develop himself	5-Show problem solving, critical thinking, decision making and life-long learning skills .
3.Show good communication and leadership skills	7- Communicate efficiently with others. 8- Work effectively in a group with demonstration of leadership skills.
4. Use technology effectively in his professional practice	2- Use effectively molecular modeling and docking programs.

6. Use available resources efficiently	4- Gain continuous access to the most recent information in the field of drug design and analysis.
7. Aware of his role in community service and development	6- Adhere to ethics of scientific research and scientific honesty.
8. Reflect commitment to integrity, credibility and accountability	

- ARS (Academic Reference Standards)
- **Matrix:** Comparison between PhD degree program ILOs and the Academic Reference Standards

	ARS	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- Demonstrate fundamental theoretical concepts and in-depth information of medicinal chemistry and impurities analysis. A.2- outline theories and aspects of drug design, drug modeling. A.3- Identify the possible mechanisms, techniques and theories present in papers.
	2.1.2- Mutual influence between professional practice and its impact on the environment.	A.6- Identify the effect of the drug synthesis and analysis on the environment and society
	2.1.3- Scientific developments in the area of specialization.	A.7- Recall new advances in medicinal chemistry research areas
	2.1.4- Moral and legal principles for professional practice in the area of specialization.	A.4- outline the ethical and legal principles in academic practices.

	2.1.5- Principles and the basics of quality in professional practice in the area of specialization.	A.5- list the principles and bases of quality assurance especially in pharmaceutical impurities in addition to drug design and modeling. A8- Describe methods of handling with chemical hazards and waste disposal.
	2.1.6- The fundamentals and ethics of scientific research.	
Intellectual Skills	2.2.1- Analyze and evaluate information in the field of specialization and analogies to solve problems	B.1- Interpret data obtained from analysis of drug and impurities to use them in a suitable manner. B.2- Evaluate obtained data during drug synthesis, drug design and their biological activity studies. B.10- Discuss results very carefully and reject errors.
	2.2.2- Solve specified problems in the lack or missing of some information.	B.3- Analyze and solve chemistry based problems.
	2.2.3-Correlate and integrate different pharmaceutical knowledge to solve professional problems.	B.4- Explore new areas of research in various fields of chemistry and develop appropriate experimental design.
	2.2.4- Conduct research and write scientific report on research specified topics.	B.5- Write scientific papers on the obtained results from the research.
	2.2.5- Evaluate and manage risks and potential hazards in professional practices in the area of specialization	B.6- Recognize and avoid possible hazards during practical work.
	2.2.6- Plan to improve performance in the field of specialization.	B.7- Improve the performance by using new techniques and following a planned protocol to obtain new results B.9- Introduce new ideas and applications in the field of impurities and drug synthesis.

	2.2.7- Professional decision-making in the contexts of diverse disciplines.	B.8- Make effective decision in complex and unpredictable situations.
Professional and Practical Skills	2.3.1- Master basic and modern professional skills in the area of specialization.	C.1- Perform standard laboratory procedures. C.4- Use available technologies either in software or instruments in the professional work. C.5- Search for newest programs in data analysis and help other scholars to use
	2.3.2- Write and evaluate professional reports.	C.2- Write with confidence reliable scientific reports and papers in medicinal chemistry research.
	2.3.3- Assess methods and tools existing in the area of specialization.	C.3- Conduct various methods and chemical techniques of analysis and assure the quality and suitability of instruments.
General and Transferable Skills	2.4.1- Communicate effectively.	D.1- Communicate clearly in oral, written and non verbal form.
	2.4.2- Effectively use information technology in professional practices	D.2- Use professional softwares and computer skills to improve performance.
	2.4.3- Self-assessment and define his personal learning needs.	D.4- Develop long learning skills and stay informed of the professional field.
	2.4.4- Use variable sources to get information and knowledge.	D.5- Use a variety of resources to investigate topics of interest including libraries, databases and internet.
	2.4.5- Set criteria and parameters to evaluate the performance of others	D.3- Evaluate other's achievement and help them to develop their performance.
	2.4.6- Work in a team and lead teams carrying out various professional tasks.	D.6- work effectively as a member of a team.
	2.4.7- Manage time effectively.	D.7- Get maximum use of time to achieve goals through hard work and attending scientific meetings.

	2.4.8- Continuous and self learning.	D.4- Develop long learning skills and stay informed of the professional field

Matrix 3: Comparison of PhD. Pharm. Sci Degree in **Medicinal Chemistry** with PhD.Medicinal Chemistry provided by School of Pharmacy, University of Illinois at Chicago,USA

School of Pharmacy, University of Illinois at Chicago,USA	M. Pharm. Sci. Degree in Medicinal Chemistry	Credit hours
MDCH 572. Drug Design. Quantitative structure-activity relationships, computer graphics, molecular modeling and simulation, and chemometrics as applied to drug design and discovery.	**Drug modeling** understand the basics and aspects of drug modeling and perform an effective method for a given problem associated with drug receptor interaction.	**4**
MDCH 507. Drug Discovery, Design and Development. Overview of drug development process from target identification and screening through clinical trials and FDA evaluation	**Selected topics in drug design** understand in depth aspects of drug design and perform an effective method for Studying topography of different receptors and enzymes.	**4**
Research	**……**	**30**

4-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:		
Msp4	Drug modeling	4	A2, A7, B2, B3, D2, D5
Msp5	Qualitative and Quantitative analysis of impurities in pharmaceutical preparation	4	A1, A3, A5, B1,B3, D2, D5
Msp6	Selected topics in drug design	4	A2, A3, A5, B2, B3, D2, D5
	Thesis	30	A1, A2, A3, A4, A5,A6, A7, A8, B1, B2, B3, B4, B5, B6, B7, B8, B9, C1, C2, C3,C4, C5, D1, D2, D3, D4, D5, D6 and D7

5-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 programme:

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

6- Admission Policy:

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

7-Student assessmentmethods:

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%

8-Failure in courses:

Students who fail to get 60 % (1 Point)

9-Methods of program evaluation

Evaluator	Method	Sample
Internal evaluator: Professor Dr. Lobna Mohammed abd-aziz	Program evaluation Courses evaluation	Program report Courses report
External evaluator: Professor Dr. Samir El Moghazy	Program evaluation Courses evaluation	Program report Courses report
Other methods • **Stockholders** • **Alumni**	Matrix with NARS Questionnaires	The Matrix Results of the questionnaires

Program coordinator **Head of Department**

Prof. Dr/ Mohammed El-Husseiny **Prof.Dr/ Kamel A. Metwally**

Drug Modeling

2019

Course specification of Drug Modeling

Course specifications:

- Program on which the course is given: PH.D. of Pharmaceutical Sciences
- Major or Minor element of program: Major
- Department offering the program: Medicinal chemistry Dept.
- Department offering the course: Medicinal chemistry Dept.
- Date of specification approval: 2019

1- Basic information:

Title: **Drug Modeling** Code: Msp4

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 understand the basics and aspects of drug modeling and perform an effective method for a given problem associated with drug receptor interaction.

3. Intended learning outcome s (ILOs) of Drug Modeling

Knowledge and Understanding	
a1	Outline the principles of drug modeling.
a2	Identify up-to-date information, mechanisms and methods in drug modeling.
a3	Recall the principles of structure data and biological data in molecular modeling.
Intellectual skills	
b1	Analyze and interpret data obtained from drug modeling.
b2	Choose & develop suitable method for a significant problem in drug receptor interaction.
General and Transferable skills	
d1	Improve professional abilities by evaluation information from different sources.
d2	Write reports and present it.

4. Course Content of Drug Modeling

Week number	Lecture contents (4hrs/week)
1	Principles of drug modeling.
2	Aspects of drug modeling
3	General purpose molecular modeling
4	Quantum chemistry calculations
5	Database of molecular structures
6	**Activity**
7	Molecular graphics
8	Data Analysis: Structure data(X-rays,NMRstructure determination)

9	Data analysis: Biological data(Bioinformatics)
10	Data analysis:Chemical data(QSAR)
11	Theory and prediction:Molecular energy
12	Theory and prediction:Molecular dynamics
13	Theory and prediction:Molecular recognition
14	**Activity** Revision & open discussion
15	Written 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 exams to assess: a1, a2, a3, b1, b2
Activities to assess: d1&d2

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 and books:

A-Scientific papers
B- Essential books:
Cohen, N. Claude in" *Guidebook on Molecular Modeling* "(2009), Elsevier
Leach, Andrew R in " *Structure-based Drug Discovery*".(2011), Springer
C- Suggested books:
Schneider G, Fechner U in" *Computer-based de novo design of drug-like molecules*".(2012)
D- Websites: pubmed, Sciencedirect, Nejm,Weilyinterscience , wikepedia and Egyptian Knowledge Bank (EKB).

Facilities required for teaching and learning:

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

- **Course Coordinators:** Prof. Dr/ **Mohammed Al-husseiny**
- **Head of Department: Prof.Dr/ Kamel A. Metwally**
- **Date:** تم اعتماد التوصيف بمجلس القسم بتاريخ

Matrix I of Drug Modeling

Course Contents		ILOs of Drug Modeling course						
		Knowledge and understanding			Intellectual skills		General and Transferable skills	
		a1	a2	a3	b1	b2	d1	d2
1	Principles of drug modeling..	x						
2	Aspects of drug modeling	x						
3	General purpose of molecular modeling	x						
4	Quantum chemistry calculations				x	x		
5	Data of molecular structure		x		x			
6	**Activity**						x	x
7	Molecular graphics		x					
8	Data analysis: structure data			x		x		
9	Data analysis: biological data			x				
10	Data analysis chemical data			x				
11	Theory and predication :Molecular energy			x				
12	Theory and predication :Molecular dynamics			x				
13	Theory and predication :Molecular recognition			x				
14	Activity						X	x
	Revision and open discussion	x	x	x	x	x		
15	Written Exam	x	x	x	x	x		

Matrix II of Drug Modeling

NARS		Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods		Method of assessment		
						Lecture	Self learning	Written exam	Oral exam	Activities
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.2- outline theories and aspects of drug design and drug modeling	a1	Principles of drug modeling. Aspects of drug modeling. General purpose of molecular modeling.	Textbooks, Scientific papers and self learning	x	x	x	x	

	2.1.3- Scientific developments in the area of specialization.	A.7- Recall new advances in medicinal chemistry research areas	a2 a3	Database of molecular structure. Molecular graphics	Textbooks, Scientific papers and self learning	x	x	x	x	
2.2	2.2.1- Analyze and evaluate the data in his\her specified area and utilize them in logical inference processes (induction/deduction).	B.2- Evaluate data obtained drug design, drug synthesis and their biological activity studies.	b1	Quantum chemistry calculations	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.3- Analyze and solve chemistry based problems.	b2	Quantum chemistry calculations	Textbooks, Scientific papers and self learning	x	x	x	x	

2.4	2.4.2- Effective use of information technologies to improve professional practices.	D.2- Use Professional softwares and computer skills to improve performance.	d1	Activity	Internet					x
	2.4.4 - Use various sources to get information and knowledge.	D.5- Use a variety of resources to investigate topics of interest including libraries, data bases, and internet	d2	Activity	Internet					x

Qualitative and Quantitative analysis of impurities in pharmaceutical preparations

2019

Course specification of Qualitative and Quantitative analysis of impurities in pharmaceutical preparations

Course specifications:

- Program on which the course is given: Ph.D. of Pharmaceutical Sciences
- Major or Minor element of program: Major
- Department offering the program: Medicinal chemistry Dept.
- Department offering the course: Medicinal chemistry Dept.
- Date of specification approval: 2019

1- Basic information:

Title: **Qualitative and Quantitative analysis of impurities in pharmaceutical preparations** Code: Msp5
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 Choose specific analytical methodology and analyze and find an effective solution for a given complex problem of impurities.

3. Intended learning outcome s (ILOs) of Qualitative and Quantitative analysis of impurities in pharmaceutical preparations

Knowledge and Understanding	
a1	outline the different techniques of impurities analysis.
a2	Review the new methods, programs and theories in impurities analysis.
a3	Summarize theories and bases of quality assurance in pharmaceutical impurities analysis.
Intellectual skills	
b1	Suggest the best analysis methods and statistically interpret data obtained from impurities analysis by using suitable program.
b2	Choose a new advanced applied method for a significant problem in impurities analysis and try to solve it.
General and Transferable skills	
d1	Improve professional abilities by evaluation information from different sources.
d2	Write reports and present it.

4. Course Content

Week number	Lecture contents (4hrs/week)
1	Introduction to more recent impurities analysis.
2	Principles of impurities analysis.
3	The most recent in drug stability assay.
4	Survey on aspects of impurities analysis.
5	Application of UPLC.

6	Application of validation parameters in impurities analysis (accuracy, precision, detection limit, quantitation limit). **Activity**
7	Tandem mass application.
8	Most recent in Radio-chemical purity & its control
9	Determination of impurities in pharmaceutical preparations containing folic acid.
10	HPLC Determination of Impurities in the Cephalosporin Antibiotic Cefepime by Ion Chromatography.
11	HPLC Determination of Impurities in the fluoroquinolone ciprofloxacin tablets.
12	Determination of Impurities in the antibiotic clindamycin capsules.
13	Rapid detection of Impurities in the fluoroquinolone lomefloxacin tablets.
14	**Activity**, Revision & open discussion
15	Written 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 exams to assess: a1, a2, a3, b1, b2
Activities to assess: d1&d2

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 and books:

A-Scientific papers
B- Suggested books:
Garfied, F .M., Klesta ,E and Hirsch, J in" Quality Assurance Principles for Analytical Laboratories".(2011)
C- Websites: pubmed, Sciencedirect, Nejm,Weilyinterscience , wikepedia and Egyptian Knowledge bank (EKB).

Facilities required for teaching and learning:

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

- **Course Coordinators:** Prof. Dr. Sobhy Mohammed Al-adl
- **Head of Department: Prof.Dr/Kamel A. Metwally**
- **Date** تم مناقشة واعتماد التوصيف بمجلس القسم بتاريخ

Matrix I of Qualitative and Quantitative analysis of impurities in pharmaceutical preparations

Course Contents		ILOs						
		Knowledge and Understanding			Intellectual skills		General and Transferable skills	
		a1	a2	a3	b1	b2	d1	d2
1	Introduction to more recent impurities analysis.	x						
2	Principles of impurities analysis .	x						
3	The most recent in drug stability assay.	x						
4	Survey on aspects of impurities analysis .		x					
5	Application of UPLC.		x		x			
6	Application of validation parameters in impurities analysis (accuracy , precision , detection limit , quantitation limit). **Activity**		x		x		x	
7	Tundem mass application.		x		x			
8	Most recent in Radio-chemical purity & its control		x					
9	Determination of impurities in pharmaceutical preparations containing folic acid.			X				
10	HPLC Determination of Impurities in the Cephalosporin Antibiotic Cefepime by Ion Chromatography.			X		x		
11	HPLC Determination of Impurities in the fluoroquinolone ciprofloxacin tablets.			X				
12	Determination of Impurities in the antibiotic clindamycin capsules.			x				
13	Rapid detection of Impurities in the fluoroquinolone lomefloxacin tablets.			x				
14	Determination of Impurities in enalapril tablets. Activity			x			x	x
15	Written Exam	x	x	x	x	x		

Matrix II of Qualitative and Quantitative analysis of impurities in pharmaceutical preparations

NARS		Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods		Method of assessment		
						Lecture	Self learning	Written exam	oral exam	Activities
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- Demonstrate fundamental theoretical concepts and in-depth information of medicinal chemistry and Impurities analysis.	a1	Introduction to more recent impurities analysis. Principles of impurities analysis . The most recent in drug stability assay.	Textbooks, Scientific papers and self learning	x	X	X	x	

		A.3 - Identify the possible mechanisms, techniques and theories present in papers.	a2	Survey on aspects of impurities analysis . Application of UPLC Validation parameters in impurities analysis (accuracy , precision , detection limit , quantitation limit). Tandem mass application Most recent in Radio-chemical purity & its control	Textbooks, Scientific papers and self learning	x	X	x	x	

	2.1.5 - The principles and bases of quality assurance in professional practice in the field of specialization.	A.5- list the principles and bases of quality assurance especially in pharmaceutical impurities in addition to drug design and modeling .	a3	Determination of impurities in pharmaceutical preparations containing folic acid. HPLC Determination of Impurities in the Cephalosporin Antibiotic Cefepime by Ion Chromatography. HPLC Determination of Impurities in the fluoroquinolone ciprofloxacin tablets. Determination of Impurities in the antibiotic clindamycin capsules. Rapid detection of Impurities in the fluoroquinolone lomefloxacin tablets. Determination of Impurities in enalapril tablets.	Textbooks, Scientific papers and self learning	x	x	x	x	

2.2	2.2.1- Analyze and evaluate the data in his\her specified area and utilize them in logical inference processes (induction/deduction) .	B.1- Interpret data obtained from analysis of drugs and impurities to use them in a suitable manner	b1	Application of UPLC Application of validation parameters in impurities analysis (accuracy , precision , detection limit , quantitation limit). Tandem mass applications	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).	B3- Analyze and solve chemistry based problems.	b2	HPLC Determination of Impurities in the Cephalosporin Antibiotic Cefepime by Ion Chromatography.	Textbooks, Scientific papers and self learning	x	x	X	x	
2.4	2.4.2- Effective use of information technologies to improve professional practice	D.2- Use professional softwares and computer skills to improve performance	d1	Activity	Internet					X

	2.4.4 - Use various sources to get information and knowledge	D.5- Use a variety of resources to investigate topics of interest including libraries, data bases and internet.	d2	Activity	Internet					X

Selected topics in drug design

2019

Course specification of selected topics in drug design

Course specifications:

- Program on which the course is given: PH.D. of Pharmaceutical Sciences
- Major or Minor element of program: Major
- Department offering the program: Medicinal chemistry Dept.
- Department offering the course: Medicinal chemistry Dept.

- Date of specification approval: 2019

1- Basic information:

Title: **Selected topics in drug design** Code: Msp6

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:

- understand in depth aspects of drug design
- perform an effective method for Studying topography of different receptors and enzymes.

3. Intended learning outcome s (ILOs) of Selected topics in drug design

Knowledge and Understanding	
a1	list aspects of drug design.
a2	Outline recent information, modes and methods in drug design.
a3	outline Topography of different receptors and enzymes
Intellectual skills	
b1	Deduce and explain data obtained from drug design.
b2	Choose and try a suitable method for a significant problem of computer associated drug design.
General and Transferable skills	
d1	Improve professional abilities by evaluation information from different sources.
d2	Write reports and present it.

4. Course Content

Week number	Lecture contents (4hrs/week)
1	Aspects of drug design.
2	Computerized applications in drug design.
3	Design of 5-HT3 antagonists .
4	Design of Acetylcholine receptor agonists .
5	Design of Dopamine receptor agonists
6	**Activity**
7	Design of Angiotensin receptor blockers .
8	Design of Cannabinoid receptor antagonists .
9	Design of CCR5 receptor antagonists .
10	Design of Bcr-Abl tyrosine kinase inhibitors .
11	Design of Cyclooxygenase 2 inhibitors .

12	Design of bcl2 receptor antagonists
13	Design of Dipeptidyl peptidase-4 inhibitors .
14	Design of HIV protease inhibitors . Activity
15	Written 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 exams to assess: a1, a2, a3, b1, b2
Activities to assess: d1&d2

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 and books:

A-Scientific papers

B- Essential books:

Krogsgaard-Larsen in"*Textbook of Drug Design and Discovery* "(2008)

Guner, Osman F in "*Pharmacophore Perception, Development, and use in Drug Design* ".(2011)

C- Suggested books:

Schneider G, Fechner U in" *Computer-based de novo design of drug-like molecules*".(2009)

D- Websites: pubmed, Sciencedirect, Nejm,Weilyinterscience and wikepedia, Egyptian Knowledge Bank (EKB)

Facilities required for teaching and learning:

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

- **Course co-ordinator: Prof.Dr/ Samy Megahed.**
- **Head of Department: Prof.Dr/ Kamel A. Metwally**
- **Date:** تم اعتماد التوصيف بمجلس القسم بتاريخ

Matrix I of selected topics in drug design (2019)

	Course Contents	ILOs						
		Knowledge and Understanding			Intellectual skills		General and Transferable skills	
		a1	a2	a3	b1	b2	d1	d1
1	Aspects of drug design.	x						
2	Computerized applications in drug design.		x		x			
3	Design of 5-HT3 antagonists .			x		x		
4	Design of Acetylcholine receptor agonists			x				
5	Design of Dopamine receptor agonists							
6	Activity		X	x		x	x	x
7	Design of Angiotensin receptor blockers .			x				
8	Design of Cannabinoid receptor antagonists .			x				
9	Design of CCR5 receptor antagonists			x				
10	Design of Bcr-Abl tyrosine kinase inhibitors .			x				
11	Design of Cyclooxygenase 2 inhibitors .			x				
12	Design of bcl2 receptor antagonists			x				
13	Design of Dipeptidyl peptidase-4 inhibitors .			x				
14	Design of HIV protease inhibitors . Activity			x			x	x
15	Written Exam	x	X	x	x	x		

Matrix II of selected topics in drug design

NARS		Program ILOs	Course ILOs	Course contents	Sources	Teaching and learning methods		Method of assessment		
						Lecture	Self learning	Written exam	Oral exam	Activities
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.2- outline theories and aspects of drug design and drug modeling.	a1	Aspects of drug design	Textbooks, Scientific papers and self learning	x	x	X	x	

		A.3 - Identify the possible mechanisms, techniques and theories present in papers.	a2	Computerized applications in drug design. Activity	Textbooks, Scientific papers and self learning	x	x	X	x	
	2.1.5 - The principles and bases of quality assurance in professional practice in the field of specialization.	A.5- list the principles and bases of quality assurance especially in pharmaceutical impurities in addition to drug design and modeling.	a3	• Design of 5-HT3 antagonists . • Design of Acetylcholine receptor agonists . • Design of Dopamine receptor agonists • Design of Angiotensin receptor blockers . • Design of Cannabinoid receptor antagonists . • Design of CCR5 receptor antagonists . • Design of Bcr-Abl tyrosine kinase inhibitors .	Textbooks, Scientific papers and self learning	x	x	X	x	

				• Design of Cyclooxygenase 2 inhibitors . • Design of bcl2 receptor antagonists • Design of Dipeptidyl peptidase-4 inhibitors . • Design of HIV protease inhibitors						
2.2	2.2.1- Analyze and evaluate the data in his\her specified area and utilize them in logical inference processes (induction/deduction).	B.2- Evaluate obtained data during drug synthesis, drug design and their biological activity studies.	b1	Computerized applications in drug design.	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.3- Analyze and solve chemistry based problems.	b2	Design of 5-HT3 antagonists .	Textbooks, Scientific papers and self learning	x	x	x	x	

2.4	2.4.2- Effective use of information technologies to improve professional practice	D.2- Use professional softwares and computer skills to improve performance	d1	Activity	Internet					x
	2.4.4 - Use various sources to get information and knowledge	D.5- Use a variety of resources to investigate topics of interest including libraries, data bases and internet.	d2	Activity	Internet					x

Thesis Specification

Thesis Specification of PhD Degree

Course specifications:

- **Program on which the course is given:** PhD of Pharmaceutical sciences (Medicinal Chemistry)
- **Major or Minor element of program:** Major
- **Department offering the program:** Medicinal Chemistry
- **Department offering the thesis:** Medicinal Chemistry
- **Date of specification approval:** 2019

1- Basic information:

Title: PhD Thesis in Medicinal Chemistry

Credit hours: 30 hrs

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, Predict new technique to solve research problems, 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 , analyze the results of the study in the light of prior knowledge and 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 outcomes (ILOs):

Knowledge and Understanding	
a1	Illustrate fundamentals and advanced knowledge in the field of medicinal chemistry and their related subjects including computer- aided drug design, drug modeling and impurities analysis that help to better understand the subject understudy.
a2	Determine methods, tools and techniques used during work.
a3	Carry out professional duties in accordance with legal and ethical guidelines.
a4	Confirm the principles and bases of quality assurance especially in pharmaceutical impurities in addition to drug design and modeling .
a5	Describe the purpose of the research work and its impact on the community and human health.
Intellectual skills	
b1	Analyze and interpret the experimental data in a suitable form to utilize them properly.
b2	Propose a solution to the point understudy depending on available data.
b3	Explore new areas of research in various fields of chemistry and develop appropriate experimental design.
b4	Write scientific papers on the obtained results from the research.
b5	Manage risks during dealing with chemical reagents.
b6	Improve the performance during the practical work.
b7	Make decisions related to recent and future studies.
b8	Be creative, innovative and original in one's approach to research.
b9	Discuss by theoretical evidences the whole work results.
Professional and practical skills	
c1	Perform practical experiments related to the point understudy.
c2	Report the work in a written report.
c3	Select appropriate methods and tools to support gools.
c4	Consider developments in technology and how to use to enhance learning.
c5	Improve the performance during the practical work.
General and Transferable skills	
d1	Communicate effectively in different forms.

d2	Be competent in the use of computers for data analysis, word-processing, and production of thesis-quality graphics.
d3	Evaluate the performance of others and assist them to develop.
d4	Recognize self-limitations and areas for improvement and seek for continuous learning.
d5	Gather, summarize, and organize information from different sources.
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 related to the problems of the community and surrounding environment. • 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 understudy. • Design the protocol including the steps of work following the suitable timetable. • Increase the awareness of the recent chemical and analytical techniques that will be used during practical work and determined by the protocol. • Integrate different knowledge (medicinal chemistry, organic chemistry, analytical chemistry ……..) to solve suggested problem. • Continuous evaluation to the thesis outcome according to the schedule.
2nd	• Identify different practical techniques and methods to assess chemical parameters related to the subject under study.

	• Operate scientific instruments according to instructions. • Evaluate and manage chemical hazards throughout the whole practical work. • Organize the experimental work according to the designed protocol (individual, parallel or sequential experiments). • Identify the essentials to good laboratory practice and quality assurance in the wide field of synthesis of a drug with a biological activity / analysis of drugs with different biological activities. • Modify methods and experiments used during practical work. • Understand any legal aspects related to the thesis work especially those related to dealing with chemicals. • Apply ethical recommendations in all aspects of scientific research e.g. citation, publication……..
3rd	• Collect raw data for the tested chemical parameters. • Interpret raw data to get valuable information. • Use new programs for data analysis. • Perform statistical analysis and chemical correlation 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. • 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. • Present the thesis in a written form • 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….)
- Open discussion

6- References:

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

Facilities required for:

- **For practical work:** Heaters with magnetic stirrer- UV lamp- Rotary evaporator- Ice machine- Infrared- 1HNMR- Mass Spectrometer- Vacuum pump- UV-VIS spectrophotometer-Water bath-PH meter- Spectrofluorimetry -HPLC

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

PhD of Medicinal chemistry (2019)																													
Program Courses		Program intended learning outcomes																											
		Knowledge and understanding								Intellectual skills									Professional and practical skills					General and transferable skills						
		A1	A2	A3	A4	A5	A6	A7	A8	B1	B2	B3	B4	B5	B6	B7	B8	B9	C1	C2	C3	C4	C5	D1	D2	D3	D4	D5	D6	D7
Special courses	Drug modelling		√					√			√	√													√			√		
	Quantitative and qualitative analysis of impurities	√		√		√				√		√													√			√		
	Selected topics in drug design		√	√		√					√	√													√			√		
Thesis		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√