Zagazig University

Faculty of Pharmacy

Medicinal Chemistry Department

Program and Course Specifications

Master and Ph.D.

Degrees

2012/2013

Master Degree

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- Coordinator: Prof. Dr.Mohammed Al-hussany

6- Date of program specification approval: 2012

B- Professional Information

1- Program aims:

The Medicinal chemistry Master program aims to equip students with the skills to do independent research at both experimental and theoretical levels through extended comprehension of key chemical concepts and in depth understanding of specialized areas.

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.

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 to ensure quality in the wide field of medicinal chemistry.

A.6- Perform tasks given ethically and with dedication.

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 medicinal chemistry study in a specific and suitable form.

B.2- Demonstrate skills in the solution of problems while there is lack of information.

B.3- Apply learnt knowledge to solve professional problems.

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

B.5- Evaluate risks in experiments and deal with them effectively.

B.6- Plan and undertake a practical and research project including accessing relevant literature and awareness of recent technical and theoretical advances which could be applied.

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

2-3 - Professional and Practical Skills:

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

C.1- Apply a wide range of synthetic and measurement techniques and develop appropriate practical skills within the workplace.

C.2- Evaluate results in medicinal chemistry research.

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

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 in the field of medicinal chemistry.

D.4- Find information from a range of sources in the field of medicinal chemistry.

D.5- Assess and form an opinion of other people's work.

D.6- Work effectively in a group environment.

D.7- Manage time and complete work to deadlines

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

3- Academic Standards:

- NARS (National Academic Reference Standards)

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

	NARS	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.
	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 to ensure quality in the wide field of medicinal chemistry.
	2.1.6- The fundamentals and ethics of scientific research.	A.6- Perform tasks given ethically and with dedication.

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 medicinal chemistry study in a specific and suitable form.
	2.2.2- Solve specified problems in the lack or missing of some information.	B.2- Demonstrate skills in the solution of problems while there is lack of information.
	2.2.3-Correlate and integrate different pharmaceutical knowledge to solve professional problems.	B.3- Apply learnt knowledge to solve professional problems.
	2.2.4- Conduct research and write scientific report on research specified topics.	B.4- Conduct research and write concrete reports on the obtained results with conclusive significances.
	2.2.5- Evaluate and manage risks and potential hazards in professional practices in the area of specialization	B.5-Evaluate risks in experiments and deal with them effectively.
	2.2.6- Plan to improve performance in the field of specialization.	B.6- Plan and undertake a practical and research project including accessing relevant literature and awareness of recent technical and theoretical advances which could be applied.
	2.2.7- Professional decision-making in the contexts of diverse disciplines.	B.7- Take professional decisions in the area of specialization.

Professional and Practical Skills	2.3.1- Master basic and modern professional skills in the area of specialization.	C.1- Apply 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 results 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 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 in the field of medicinal chemistry.
	2.4.4- Use variable sources to get information and knowledge.	D.4- Find information from a range of sources in the field of medicinal chemistry.

	2.4.5- Set criteria and parameters to evaluate the performance of others	D.5- Assess and form an opinion of other people's work.
	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.

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,D4
M101	Advanced Instrumental Analysis & chromatography I	4	A1, A2, B1,D4
M106	Physical chemistry	4	A1, B1, B2, D2, D5, D6
ME3	Elective A Good practice for analysis of drugs and quality control	4	A1, A3, A5, B1,B5,D2,D4
ME2	Elective B Drug Stability	4	A1, A2, A5, B1, B2
	Special Courses:		

Msp1	Computer Aided Drug Design	4	A1, A3, B7,D2,D4
Msp2	Validation Parameters in Drug Analysis	4	A1, A3, A5, B1, B7,D2,D4
Msp3	Advanced Medicinal Chemistry	4	A1, A3, B3, D2,D4
	Thesis	30	A1, A2, A3, A4, A5, A6, B1, B2, B3, B4, B5, B6, B7, C1, C2, C3, D1, D2, D3, D4, D5, D6, D7 and D8

5-Program admission requirements:

- Candidate should have obtained the certificate of Bachelor degree in pharmaceutical sciences with general grade good and grade good in the specialty from one of the Egyptian universities or an equivalent certificate from a foreign institute recognized by the university.
- Admission is in October each year.

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%

8-Failure in Courses:

Students who fail to get 60% (1 point)

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.	Program evaluation Courses evaluation	Program report Courses report
Others methods	Matrix with NARS Questionnaires	The Matrix Results of the questionnaires

Program coordinator **Head of Department**

Prof. Dr.Mohammed Al-hussan **Prof. Dr. Mansour Abo Koul**

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: 2012/2013

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 define the drug design, diagnose possible techniques for drug design and discuss different methods of drug development.

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

Knowledge and Understanding	
a1	Outline basic information related to drug design
a2	Identify applications of drug design and drug development
a3	Illustrate clearly the up-to date information & methods in drug design
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	Definition of drug design.
2	Drug design applications.
3	Docking.
4	Docking.
5	Combinatorial chemistry
6	Combinatorial chemistry
7	Drug development. **Activity(Reports)**
8	SAR & QSAR in drug design
9	Drug latentiantion.
10	Drug latentiantion
11	Principles in drug Modeling
12	Computer-aided drug design **Activity(Reports)**
13	Drug metabolism (Phase I)
14	Drug metabolism (Phase II)
15	Revision & Open Discussion

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 7-12
Assessment (2): Written exam	Week 16
Assessment (3): oral exam	Week 16

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:

i- Burger's medicinal chemistry and drug discovery

Edited by Manfred E.wolff(2006)

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)

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, computers and data show.

- **Course Coordinators: Prof.Dr/Mohammed Al-hussany**
- **Head of Department: Prof.Dr/ Mansour Abukull**
- **Date: 2012/9/3 تم اعتماد التوصيف بالقسم بتاريخ**

Matrix I of Drug Design (2012-2013)

	Course Contents	ILOs of Drug Design course				
		Knowledge and understanding			Intellectual skills	General and Transferable skills
		a1	**a2**	**a3**	**b1**	**d1**
1	Definition of drug design	x				
2	Drug design applications		x			
3	Docking.			x		
4	Docking.			x		
5	Combinatorial chemistry	x				
6	Combinatorial chemistry	x				
7	Drug development Activity(Reports)		x			X
8	SAR & QSAR in drug design			x	X	
9	Drug latentiantion.	x			X	
10	Drug latentiantion.	x			X	
11	Principles in drug Modeling			x		
12	Computer-aided drug design Activity(Reports)			x		X
13	Drug metabolism (Phase I)	x				
14	Drug metabolism (PhaseII)	x				
15	Revision and open discussion	x	x	x	X	

Matrix II of Drug Design (2012-2013)

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.	a1	Definition of drug design. Combinatorial chemistry Drug latentiantion Drug metabolism (Phase I) Drug metabolism (PhaseII)	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 diagnosis, developing molecules and drug design that serves the community and the patients.	a2	Drug design applications Drug development	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.	a3	Docking SAR & QSAR in drug design Principles in drug Modeling Computer-aided drug design	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- Apply learnt knowledge to solve professional problems.	b1	SAR & QSAR in drug design Drug latentiantion	Textbooks, Scientific papers and self learning	x	x	X	X	

2.4	2.4.4- Use variable sources to get information and knowledge.	D.4- Find information from a range of sources in the field of medicinal chemistry.	d1	Activity (Reports)	Internet Textbooks		X			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
- 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: 2012/2013

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**,** state the concepts of diagnosing cardiac diseases, G.I.T diseases and infections through IR, HNMR and UV spectrophotometry and state the basic principles 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 properly theories of different instruments used in analysis
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	Ultra-violet spectroscopy
2	Vibrational spectroscopy (IR spectroscopy)
3	Nuclear magnetic resonance (NMR)
4	Mass spectrometry(MS)
5	Medicinal application of spectroscopy in diagnosis of diseases
6	Surface analysis
7	Liquid chromatography **Activity (Reports)**

8	HPLC & its theory
9	HPLC & its medicinal and pharmaceutical application
10	Gas chromatography its theory
11	GC & its medicinal and pharmaceutical application
12	Supercritical fluid chromatography (SFC)
13	Capillary electrophoresis(CE)
14	Analytical application of polymers **Activity (Reports)**
15	Revision & open discussion

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 16
Assessment (3): oral exam	Week 16

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:

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

- **Course Coordinators: Prof. Dr. Al Sayed Lashen**
- **Head of Department: Prof.Dr/ Mansour Abukull**
- **Date: 2012/9/3 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	Ultra-violet spectroscopy	x	x	X	
2	Vibrational spectroscopy (IR spectroscopy)	x	x	X	
3	Nuclear magnetic resonance (NMR)	x	x	X	
4	Mass spectrometry(MS)	x	x	X	
5	Medicinal application of spectroscopy in diagnosis of diseases		x	X	
6	Surface analysis	x			
7	Liquid chromatography **Activity (Reports)**	x		X	X
8	HPLC & its theory	x			
9	HPLC & its medicinal and pharmaceutical application		x	X	
10	Gas chromatography its theory	x			
11	GC & its medicinal and pharmaceutical application		x	X	
12	Supercritical fluid chromatography (SFC)	x	x		
13	Capillary electrophoresis(CE)	x	x		
14	Analytical application of polymers **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.	a1	Ultra-violet spectroscopy Vibrational spectroscopy (IR spectroscopy) Nuclear magnetic resonance (NMR) Mass spectrometry(MS) Surface analysis Liquid chromatography HPLC & its theory Gas chromatography its theory Supercritical fluid chromatography (SFC) Capillary electrophoresis(CE)	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 mutual interaction between professional practices on one hand and community and surrounding environment on the other hand	a2	Ultra-violet spectroscopy Vibrational spectroscopy (IR spectroscopy) Nuclear magnetic resonance (NMR) Mass spectrometry(MS) Medicinal application of spectroscopy in diagnosis of diseases HPLC & its medicinal and pharmaceutical application GC & its medicinal and pharmaceutical application Supercritical fluid chromatography (SFC) Capillary electrophoresis(CE) Analytical application of polymers	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 medicinal chemistry study in a specific and suitable form.	b1	Ultra-violet spectroscopy Vibrational spectroscopy (IR spectroscopy) Nuclear magnetic resonance (NMR) Mass spectrometry(MS) Medicinal application of spectroscopy in diagnosis of diseases HPLC & its medicinal and pharmaceutical application GC & its medicinal and pharmaceutical application	Textbooks, Scientific papers and self learning	X	x	X	X	
2.4	2.4.4- Use variable sources to get information and knowledge.	D.4- Find information from a range of sources in the field of medicinal chemistry.	d1	Activity (Reports)	Internet Textbooks		x			x

Good practice for analysis of drugs and quality control

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: 2012/2013

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, analyze 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 principles of drug analysis & quality control
a2	Express up-to-date information in the field of drug analysis
a3	Illustrate the basics in 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	Good Manufacture Practice (GMP)
2	Application of quantitative analysis
3	Quality control
4	Quality assurance
5	Applications of Spectrophotometric analysis for dosage forms **Activity**
6	H1,C13,N15,F19 NMR
7	Advanced techniques in mass spectroscopy
8	Atomic absorption
9	Fluorimetric analysis
10	Radioimmune Assay
11	Electrophoresis

12	GC-MS chemistry **Activity**
13	Spectrodenistometric (TLC scanner)
14	Forensic chemistry
15	Revision & Open Discussion

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 16
Assessment (3): oral exam	Week 16

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

Facilities required for teaching and learning:

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

- **Course Coordinators: Prof.Dr/ Sobhy ElAdl**

  Prof.Dr/ Mohammed Baraka
- **Head of Department: Prof.Dr/ Mansour Abukull**
- **Date: 2012/9/3 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	a3	b1	b2	d1	d2
1	Good Manufacture Practice (GMP)	x		x				
2	Application of quantitative analysis	x	x	x				
3	Quality control	x		x	x			
4	Quality assurance	x		x				
5	Spectrophotometric analysis(UV-VIS-IR) **Activity**		x		x	x	x	X
6	H1,C13,N15,F19 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	Gas chromatography **Activity**	x		x			x	X
13	Spectrodenistometric (TLC scanner)	x		x	x			
14	HPLC & its applications	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.	a1	Good Manufacture Practice (GMP) Application of quantitative analysis H1,C13,N15,F19 NMR Forensic chemistry Spectrodenistometric (TLC scanner) 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 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 Good Manufacture Practice (GMP) Application of quantitative analysis Quality control Quality assurance	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 medicinal chemistry study in a specific and suitable form.	b1	Quality control 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 in experiments and deal with them effectively.	b2	Applications of Spectrophotometric analysis for dosage forms Advanced techniques in mass spectroscopy Atomic absorption Fluorimetric analysis H1,C13,N15,F19 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	d1	Activity (Reports)	Internet Textbooks		x			x
	2.4.4- Use variable sources to get information and knowledge.	D.4- Find information from a range of sources in the field of medicinal chemistry.	d2	Activity (Reports)	Internet Textbooks		x			X

Courses offered by other departments

Physical Chemistry

Course specification of Physical Chemistry

Course specifications:

- Program on which the course is given: Master's of Pharmaceutical Sciences
- Major or Minor element of program: Major
- Department offering the program: Medicinal Chemistry.
- Department offering the course: Analytical Chemistry.
- Date of specification approval: 2012/2013

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 will be able to outline the principles of physical, general chemistry, thermochemistry and thermodynamics and describe states of matter, units of measurements and calculations with chemical formulas and equations.

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

A- Knowledge and Understanding	
a1	Outline the principles of physical, general chemistry, thermochemistry and thermodynamics.
a2	Demonstrate the behavior and laws governing gas, solutions and colloids.
B- Intellectual skills	
b_1	Describe units of measurements and calculations with chemical formulas and equations.
b_2	Integrate the knowledge and information obtained from physical and general chemistry principles in determining molecular formulas and stoichoimetry 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:

Week number	Contents
1	Introduction, classification, state and properties of matter
2	Units of measurements and dimensional analysis.
3	Calculations with chemical formulas and equations.
4	Gases Physical behavior of gases. Measurement of gas pressure

5	The gas laws: Boyles law. Charles law. Gay-lussac's law. Combined gas law.
6	The ideal gas equation. Dalton Law. Graham's law. Deviation from ideal behavior.
7	Thermochemistry: Introduction. Internal energy E. Heat content. Thermochemical equations.
8	Heat of Combustion Heat of formation Variation of heat of reaction with temperature.
9	Thermodynamics: The second law of thermodynamics Measurement of the heat of the reaction
10	Solutions: Principles and concentration and solubility.
11	Factors affecting solubility Solute-solvent interaction. Solubility and temperature. Effect of pressure on solubility.
12	Solutions of liquids in liquids Solutions of solid in liquids (Colligative properties of solutions.)

13	Colloids Types of colloids Preparation of sols.
14	Purification of sols. Electrical properties of sols.
15	Open discussion and revision

5- Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion

6- Student Assessment methods:

Written exams to assess: a1, a2, b1and b2
Oral exam to assess: a1, a2, b1and b2
Activity to assess: d1,d2 and d3

Assessment schedule:

Assessment (1): Activity	Week 8
Assessment (2): Written exam	Week 16
Assessment (3): oral exam	Week 16

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:

Physical Chemistry , Developing A Dynamic Curriculum , Richard N. Schwenz & Robert G. Mooore , American Chemical Society (1993)

C- Suggested 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).

C- Websites:

www.sciencedirect.com

www.rsc.org

Facilities required for teaching and learning:

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

- **Course Coordinators: Ass. Prof Dr/ Wafaa Hassan**
- **Head of Department: Prof Dr/ Mohamed Nageb El-Balkeny**
- **Date: 2012-8-28 تم اعتماده فى مجلس القسم بتاريخ**

Drug Stability

Course specification of Drug stability

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
- **Department offering the course:** Pharmaceutics Dept.
- **Date of specification approval:** 2012/2013

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 gain the ability to predict the degradation pathways of a drug design a stabilization protocol and predict a product shelf-life.

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

Knowledge and Understanding	
a1	Illustrate the principles of order of reactions and methods of determination order of reactions
a2	Describe the principles of physical and chemical degradation of drugs in different dosage forms
a3	Mention stability testing of different dosage forms
Intellectual skills	
b1	Suggest suitable stabilization 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	Demonstrate critical thinking and decision making during pharmaceutical preparations

4. Course Content of Drug stability:

Week number	Lecture content (4 hrs/week)
1	• Rate of chemical reactions
2	• Orders of reactions • Zero order
3	• First order
4	• Second order
5	• Apparent zero order reaction • Pseudo first order reaction
6	• Determination of order of reaction • -Substitution method
7	• Graphical method **(Presentation)**

8	• Half-life method
9	• Routes of degradation • -Hydrolysis • -Oxidation
10	• -Photochemical degradation • -Incompatibility
11	• Physical degradation routes • -Vaporization • -Aging • - adsorption
12	• Complex reactions
13	• Stability testing
14	• Revision
15	• Open discussion **(Final Presentation)**

5- Teaching and Learning Methods:

- Lectures
- Self learning
- Open discussion

6- Student Assessment methods:

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

Assessment schedule:

Assessment (1): Activity	Week 7, 15
Assessment (2): Written exam	Week 16
Assessment (3): oral exam	Week 16

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: Handbook of Stability Testing in Pharmaceutical Development: Regulations, Methodologies, and Best Practices, Kim Huynh-Ba, 389 (2008).
C- Websites: Pubmed, Sciencedirect, Weilyinterscience

Facilities required for teaching and learning:

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

- **Course Coordinators: Dr/ Hanaa Abd El-Fattah El-Ghamry**
- **Head of Department: Prof Dr/ Mahmoud Abdul-Ghany Mahdy**
- **Date: 2012-9-3 تم اعتماده فى مجلس القسم بتاريخ**

Computer Aided Drug Design

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: 2012/2013

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 outline computational chemistry, demonstrate computer-aided tools in drug design and find a starting point for a laboratory synthesis, or to assist in understanding experimental data, such as the position and source of spectroscopic peaks.

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

Knowledge and Understanding	
a1	Illustrate the principles of 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	Types of drug design • Ligand- based • Structure-based
2	Rational drug discovery
3	Computational chemistry & its history
4	Accuracy
5	Methods for determination of molecular structure • Ab initio methods
6	Methods for determination of molecular structure • Density functional methods
7	Methods for determination of molecular structure • Semi-empirical and empirical methods **Activity**
8	Methods for determination of molecular structure • Molecular mechanics
9	Methods for determination of molecular structure • Methods for solids
10	Methods for determination of molecular structure • Chemical dynamics
11	Methods for determination of molecular structure

	• Molecular dynamics
12	Cheminformatics **Activity**
13	Interpreting molecular wave functions
14	Fields of computational chemistry applications
15	Revision & open discussion

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 7-12
Assessment (2): Written exam	Week 16
Assessment (3): oral exam	Week 16

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:

- 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.

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:

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

Course Coordinators: Prof. Dr/Mohammed Al-hussany
Prof. Dr/ Mansour Abukull

- **Head of Department: Prof.Dr/ Mansour Abukull**
- **Date: 2012/9/3 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	Types of drug design • Ligand- based • Structure-based	x				
2	Rational drug discovery	x	X			
3	Computational chemistry & its history	x	X			
4	Accuracy	x				
5	Methods for determination of molecular structure • Ab initio methods	x	X			
6	Methods for determination of molecular structure • Density functional methods	x	X			
7	Methods for determination of molecular structure • Semi-empirical and empirical methods **Activity**	x	X		X	x
8	Methods for determination of molecular structure • Molecular mechanics	x	X			
9	Methods for determination of molecular structure • Methods for solids	x	X			
10	Methods for determination of molecular structure • Chemical dynamics Tenth week	X	X			

11	Methods for determination of molecular structure Molecular dynamics	X	X			
12	Cheminformatics **Activity**	X	X		X	x
13	Interpreting molecular wave functions		X			
14	Fields of computational chemistry applications		X	x		
15	Revision and open discussion	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.	a1	Types of drug design • Ligand- based • Structure-based Rational drug discovery Computational chemistry & its history Accuracy Methods for determination of molecular structure • Ab initio methods Methods for determination of molecular structure • Density functional methods	Textbooks, Scientific papers and self learning	X	x	x	x	

				Methods for determination of molecular structure • Semi-empirical and empirical methods Methods for determination of molecular structure • Molecular mechanics Methods for determination of molecular structure • Methods for solids Methods for determination of molecular structure • Chemical dynamics Methods for determination of molecular structure Molecular dynamics Cheminformatics						

	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.	a2	Rational drug discovery Computational chemistry & its history Accuracy Methods for determination of molecular structure • Ab initio methods Methods for determination of molecular structure • Density functional methods Methods for determination of molecular structure • Semi-empirical and empirical methods Methods for determination of molecular structure • Molecular mechanics Methods for determination of molecular structure • Methods for solids Methods for determination of molecular structure • Chemical dynamics Methods for determination of molecular structure Molecular dynamics Cheminformatics Interpreting molecular wave functions Fields of computational chemistry applications	Textbooks, Scientific papers and self learning	x	X	x	x	

2.2	2.2.7- Professional decision-making in the contexts of diverse disciplines.	B.7- Take professional decisions in the area of specialization.	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- Find information from a range of sources in the field of medicinal chemistry.	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: 2012/2013

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 & develop 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 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 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	Experimental errors
3	Choice methods of analysis Statistic of data analysis
4	Validation parameters of analytical procedures (specificity , linearity , range)
5	Validation parameters of analytical procedures (accuracy , precision , detection limit , quantitation limit)
6	Validation parameters of analytical procedures (robustness , ruggedness , system suitability test) **Activity**
7	Drug stability & stability indicating assay

8	Chemical purity & its control
9	Functional group analysis Classical analysis
10	Functional group analysis instrumental analysis
11	Automation in pharmaceutical analysis Mass spectroscopy Flow injection analysis
12	Automation in pharmaceutical analysis HPLC chromatography GC chromatography
13	Determination of active ingredients in different dosage forms **Activity**
14	Determination of active ingredients in different dosage forms
15	Revision & open discussion

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 16
Assessment (3): oral exam	Week 16

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:

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

- **Course Coordinator: Prof. Dr/ AdbAllah ElShanawany**
- **Head of Department: Prof.Dr/ Mansour Abukull**
- **Date: 201/9/3 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	Experimental errors	x						
3	Choice methods of analysis Statistic of data analysis	x	x		X			
4	Validation parameters of analytical procedures (specificity , linearity , range)		x	x				
5	Validation parameters of analytical procedures (accuracy , precision , detection limit , quantitation limit)		x	x				
6	Validation parameters of analytical procedures (robustness , ruggedness , system suitability test) **Activity**		x	x			x	x
7	Drug stability & stability indicating assay			x				
8	Chemical purity & its control	x						
9	Functional group analysis Classical analysis			x				
10	Functional group analysis instrumental analysis			x				

11	Automation in pharmaceutical analysis Mass spectroscopy Flow injection analysis	x	x	x				
12	Automation in pharmaceutical analysis HPLC chromatography GC chromatography	x	x	x				
13	Determination of active ingredients in different dosage forms **Activity**					x	x	x
14	Determination of active ingredients in different dosage forms					x		
15	Revision and open discussion	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.	a1	Sampling Experimental errors Choice 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.	a2	Choice methods of analysis 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 to ensure quality in the wide field of medicinal chemistry.	a3	Validation parameters of analytical procedures Drug stability & stability indicating assay 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 medicinal chemistry study in a specific and suitable form.	b1	Statistic of data analysis	Textbooks, Scientific papers and self learning	x	x	x	X	

	2.2.7- Professional decision-making in the contexts of diverse disciplines.	B.7- Take professional decisions in the area of specialization.	b2	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- Find information from a range of sources in the field of medicinal chemistry.	d2	Activity	Internet		x			x

Advanced Medicinal Chemistry

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: 2012/2013

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 principles of gene therapy, anti-aging drugs and antisense drugs and demonstrate awareness of ethical & legal aspects of pharmaceutical practice in topics related to medicinal chemistry.

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

Knowledge and Understanding	
a1	Illustrate the principle of working 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	Take professional decision 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	Challenges in gene therapy :Gene therapy development
2	Characteristics of somatic and :Gene therapy germ-line gene therapy
3	Recombinant DNA and gene :Gene therapy therapy
4	Strategies for gene therapy:Gene therapy
5	Gene therapy: Clinical applications of gene therapy **Activity(Presentation)**
6	Introduction about antisense :Antisense therapy drugs for treatment of cancer
7	Example antisense therapies Cytomegalovirus retinitis

	Hemorrhagic fever viruses
8	Example antisense therapies Cancer HIV/AIDS
9	Antiaging drugs
10	Antioxidants as Drugs against Aging
11	The First Antioxidant Drugs Suggested: BHT and Others **Activity(Presentation)**
12	Pantothenate, a Vitamin May Work as antiaging
13	Deanol, a Test Case for Anti Aging Drugs
14	Levodopa, the Hard Stuff
15	Revision & Open discussion

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 5-11
Assessment (2): Written exam	Week 16
Assessment (3): oral exam	Week 16

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:

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

- **Course Coordinators: Prof. Dr. Mohammed AL_hussany**
- **Head of Department: Prof.Dr/ Mansour Abukull**
- **Date: 2012/9/3 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	Gene therapy: Challenges in gene therapy development	x					
2	Gene therapy: Characteristics of somatic and germ-line gene therapy	x					
3	Gene therapy: Recombinant DNA and gene therapy	x	x				
4	Gene therapy: Strategies for gene therapy		x				
5	Gene therapy: Clinical applications of gene therapy Activity(Presentation)		x	X		x	x
6	Introduction about antisense :Antisense therapy drugs for treatment of cancer	x	x				
7	Example antisense therapies 1 Cytomegalovirus retinitis 2 Hemorrhagic fever viruses	x					
8	Example antisense therapies 3 Cancer 4 HIV/AIDS	x		X			
9	Antiaging drugs	x	x				
10	Antioxidants as Drugs against Aging	x	x				
11	The First Antioxidant Drugs Suggested: BHT and Others Activity(Presentation)	x	x			x	x
12	Pantothenate, a Vitamin May Work as antiaging	x	x				
13	Deanol, a Test Case for Anti Aging Drugs	x	x				
14	Levodopa, the Hard Stuff	x	x				
15	Revision & Open discussion	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	2.1.1- Theories and fundamentals related to the field of learning as well as in related areas.	A.1- Outline the concepts associated with medicinal chemistry.	a1	Gene therapy antisense drugs Antiaging drugs Antioxidants	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.	a2	Gene therapy antisense drugs Antiaging drugs Antioxidants	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- Apply learnt knowledge to solve professional problems.	b1	Clinical applications of gene therapy Example antisense therapies	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- Find information from a range of sources in the field of medicinal chemistry.	d2	Activity	Internet		x			x

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:** 2012/2013

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:

1. **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/ Mansour Abukull**

Master Thesis (Medicinal Chemistry)				
NARS		Program ILOs	Thesis ILOs	Thesis content
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.	Understand all required knowledge related to thesis work.	• Collect all available information about this subject by all possible means.
	2.1.2- Mutual influence between professional practice and its impact on the environment.	A.2- Identify the applications of theories in diagnosis, developing molecules and drug design that serves the community and the patients.	Select the point of the thesis according to the problems present in the community.	• 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.
	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.	Be aware with recent techniques and developments that can be used during study.	• Increase the awareness of the recent chemical and analytical techniques that will be used during practical work and determined by the protocol.

	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.	Understand any legal aspects related to the thesis work.	• Understand any legal aspects related to the thesis work especially those related to dealing with chemicals.
	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.	Identify the principles to ensure quality in the wide field of medicinal chemistry.	• 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.
	2.1.6- The fundamentals and ethics of scientific research.	A.6- Perform tasks given ethically and with dedication.	Perform tasks given ethically and with dedication.	• Apply ethical recommendations in all aspects of scientific research e.g citation, publication……..

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 medicinal chemistry study in a specific and suitable form.	Analyze and interpret the experimental data in a suitable form to solve the suggested problem.	• 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.
	2.2.2- Solve specified problems in the lack or missing of some information.	B.2- Demonstrate skills in the solution of problems while there is lack of information.	Predict solution to the problem in the light of available data.	• Suggest solution to the problem understudy based on this presented data.
	2.2.3-Correlate and integrate different pharmaceutical knowledge to solve professional problems.	B.3- Apply learnt knowledge to solve professional problems.	Integrate all required knowledge to solve problems that may rise during practical work.	• Integrate different knowledge (medicinal chemistry, organic chemistry, analytical chemistry ……..) to solve suggested problem.

	2.2.4- Conduct research and write scientific report on research specified topics.	B.4- Conduct research and write concrete reports on the obtained results with conclusive significances.	Conduct a research project and write scientific reports.	• Write scientific reports on the obtained results with conclusive significance.
	2.2.5- Evaluate and manage risks and potential hazards in professional practices in the area of specialization	B.5-Evaluate risks in experiments and deal with them effectively.	Manage risks and hazards during practical work.	• Evaluate and manage chemical hazards throughout the whole practical work.
	2.2.6- Plan to improve performance in the field of specialization.	B.6- Plan and undertake a practical and research project including accessing relevant literature and awareness of recent technical and theoretical advances which could be applied.	Plan and undertake a practical and research project including accessing relevant literature and awareness of recent technical and theoretical advances which could be applied.	• Design the protocol including the steps of work following the suitable timetable. • Identify different practical techniques and methods to assess chemical parameters related to the subject under study. •Suggest possible recommendations based on the outcome of the thesis and decide future plans.

	2.2.7- Professional decision-making in the contexts of diverse disciplines.	B.7- Take professional decisions in the area of specialization.	Make decisions related to recent and future studies.	•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. • Suggest possible recommendations based on the outcome of the thesis and decide future plans.
Professional and Practical Skills	2.3.1- Master basic and modern professional skills in the area of specialization.	C.1- Apply a wide range of synthetic and measurement techniques and develop appropriate practical skills within the workplace.	Apply a wide range of synthetic and measurement techniques and develop appropriate practical skills within the workplace.	• Identify different practical techniques and methods to assess chemical parameters related to the subject under study. • Operate scientific instruments according to instructions.

	2.3.2- Write and evaluate professional reports.	C.2- Evaluate results in medicinal chemistry research.	Report the work in a written report.	• 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…….).
	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.	Asses used methods, tools and instruments in the research.	• Identify different practical techniques and methods to assess chemical parameters related to the subject under study. • Operate scientific instruments according to instructions.
General and Transferable Skills	2.4.1- Communicate effectively.	D.1- Communicate and express clearly ideas both orally and in writing.	Communicate effectively with professionals.	• Communicate with supervisors to discuss results.
	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.	Use information technology in review and thesis preparation.	• Present the results periodically in seminars • Demonstrate the thesis in a final power point presentation.

	2.4.3- Self-assessment and define his personal learning needs.	D.3- Practice self assessment of learning needs in the field of medicinal chemistry.	Evaluate the work and learning needs.	• Continuous evaluation to the thesis outcome according to the schedule.
	2.4.4- Use variable sources to get information and knowledge.	D.4- Find information from a range of sources in the field of medicinal chemistry.	Use various sources to get information about the subject understudy.	• Use internet, journals, books and others thesis to get previous and recent information about the subject understudy.
	2.4.5- Set criteria and parameters to evaluate the performance of others	D.5- Assess and form an opinion of other people's work.	Set rules for evaluation and judging others performance.	• Discuss obtained results in comparison with pervious literatures.
	2.4.6- Work in a team and lead teams carrying out various professional tasks.	D.6- Work effectively in a group environment.	Work effectively as a member of a team.	• Work effectively as a member of a team (e.g. Supervisors and various professionals).
	2.4.7- Manage time effectively.	D.7-Manage time and complete work to deadlines	Acquire time management skills.	· Organize the experimental work according to the designed protocol.
	2.4.8- Continuous and self learning.	D.8- Manage own learning and appreciate the importance of continuing professional development.	Study independently and plan research studies.	• Continue self-learning throughout the experimental work and writing scientific papers.

PhD Degree

Program Specification

Program Specification

A- Basic Information

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

2- Program type: Monodisciplinary.

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

4- Department: Medicinal Chemistry

5- Coordinator: Prof. Dr.Mohammed Al-hussany

6- Date of program specification approval: 2012

B- Professional Information

1- Program aims:

The Medicinal chemistry PhD program aims provide the PhD students with a special and advanced education in the field of Medicinal Chemistry and enable students to gain the skills and attitudes required for conducting planned research in the field of Medicinal Chemistry.

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 their related subjects including computer- aided drug design, drug modeling and impurities analysis.

A.2- Identify the possible mechanisms, techniques and theories present in papers.

A.3- Have the ability to interpret ethical and legal principles in academic practices.

A.4- Confirm the principles and bases of quality assurance especially in pharmaceutical impurities in addition to drug design and modeling.

A.5- Identify the effect of the specified research on the environment and society.

2-2 - Intellectual Skills:

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

B.1- Evaluate data obtained from medicinal chemistry study e.g. impurities and drug synthesis to use them in a suitable manner.

B.2- Analyze and solve chemistry based problems.

B.3- Explore new areas of research in various fields of chemistry and develop appropriate experimental design.

B.4- Write scientific papers on the obtained results from the research.

B.5- Recognize and avoid possible hazards during practical work.

B.6- Improve the performance by using new techniques and following a planned protocol to obtain new results.

B.7- Make effective decision in complex and unpredictable situations.

B.8- Try to introduce new ideas and applications in the field of impurities and drug synthesis.

B.9- 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 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 softwares 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 others achievement and help them to develop their performance.

D.4- Be life long learners 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- Function positively 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:

- NARS (National Academic Reference Standards)

Matrix: Comparison between PhD degree program ILOs and the National Academic Reference Standards

	NARS	Program ILOs
Knowledge and Understanding	2.1.1- Fundamental and in-depth knowledge and basic theories in the field of specialty and the closely related areas of pharmaceutical sciences.	A.1- Demonstrate fundamental theoretical concepts and in-depth information of medicinal chemistry and their related subjects including computer- aided drug design, drug modeling and impurities analysis.
	2.1.2- Fundamentals, methods, techniques, tools and ethics of scientific research.	A.2- Identify the possible mechanisms, techniques and theories present in papers.
	2.1.3- The ethical and legal principles in pharmacy and academic practices.	A.3- Have the ability to interpret ethical and legal principles in academic practices .
	2.1.4- The principles and bases of quality assurance in professional practice in the field of specialization.	A.4- Confirm the principles and bases of quality assurance especially in pharmaceutical impurities in addition to drug design and modeling.
	2.1.5- All relevant knowledge concerning the impact of professional practice on society and environment and the ways of their conservation and development.	A.5- Identify the effect of the specified research on the environment and society.
Intellectual Skills	2.2.1- Analyze and evaluate the data in his\her specified area and utilize them in logical inference processes (induction/deduction).	B.1- Evaluate data obtained from medicinal chemistry study e.g impurities and drug synthesis to use them in a suitable manner.

	2.2.2- propose solutions to specified problems in the light of the available data (information).	B.2- Analyze and solve chemistry based problems.
	2.2.3- Conduct research studies that add to the current knowledge.	B.3- Explore new areas of research in various fields of chemistry and develop appropriate experimental design.
	2.2.4- Formulate scientific papers.	B.4- Write scientific papers on the obtained results from the research.
	2.2.5- Asses hazards and risks in professional practice in his \ her areas of specialization.	B.5- Recognize and avoid possible hazards during practical work.
	2.2.6- Plan to improve performance in the pharmaceutical area of interest.	B.6- Improve the performance by using new techniques and following a planned protocol to obtain new results.
	2.2.7- Take Professional decisions and bears responsibility in wide array of pharmaceutical fields.	B.7- Make effective decision in complex and unpredictable situations.
	2.2.8- Be creative and innovative.	B.8- Try to introduce new ideas and applications in the field of impurities and drug synthesis.
	2.2.9- Manage discussions and arguments based on evidence and logic.	B.9- Discuss results very carefully and reject errors.

Professional and Practical Skills	2.3.1- Master basic and modern professional skills in the area of specialization.	C.1- Perform standard laboratory procedures.
	2.3.2- Write and critically evaluate professional reports.	C.2- Write with confidence reliable scientific reports in medicinal chemistry research .
	2.3.3- Evaluate and develop 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.
	2.3.4- Properly use technological means in abetter professional practice.	C.4- Use available technologies either in softwares or instruments in the professional work.
	2.3.5- Plan to improve professional practice and to improve the performance of other scholars.	C.5- Search for newest programs in data analysis and help other scholars to use.
General and Transferable Skills	2.4.1- Effective Communication in its different forms.	D.1-Communicate clearly in oral, written and non verbal form.
	2.4.2- Effective use of information technologies to improve professional practices.	D.2- Use professional softwares and computer skills to improve performance.
	2.4.3- Help others to learn and evaluate their performance.	D.3- Evaluate others achievement and help them to develop their performance.
	2.4.4- Self-assessment and continuous learning.	D.4- Be life long learners and stay informed of the professional field.

	2.4.5- Use various sources to get information and knowledge.	D.5- Use a variety of resources to investigate topics of interest including libraries, databases and internet.
	2.4.6- Work as a member and lead a team of workers.	D.6- Function positively as a member of a team.
	2.4.7- Direct scientific meetings and to manage time effectively.	D.7- Get maximum use of time to achieve goals through hard work and attending scientific meetings.

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	A1, A2, A4, B1, B2,D2,D4
Msp5	Qualitative and Quantitative analysis of impurities in pharmaceutical preparation	4	A1, A2, A4, B1, B2,D2,D4
Msp6	Selected topics in drug design	4	A1, A2, A4, B1, B2,D2,D4
	Thesis	30	A1, A2, A3, A4, A5, 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:

- Candidate should have obtained the certificate of Master degree in pharmaceutical sciences in the same specialty from one of the Egyptian universities or an equivalent certificate from a foreign institute recognized by the university.

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%

8-Failure in Courses:

Students who fail to get 60% (1 point)

9-Methods of program evaluation

Evaluator	Method	Sample
Internal evaluator: Professor Dr. El-Sayed Lashin	Program evaluation Courses evaluation	Program report Courses report
External evaluator: Professor Dr.	Program evaluation Courses evaluation	Program report Courses report
Others methods	Matrix with NARS Questionnaires	The Matrix Results of the questionnaires

Program coordinator **Head of Department**

Prof. Dr.Mohammed Al-hussany **Prof.Dr/ Mansour Abukull**

Drug Modeling

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: 2012/2013

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	Confirm the principles and bases of quality assurance especially in pharmaceutical drug 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	Introduction to drug modeling.
2	Principles of drug modeling.
3	Different types of drug modeling.
4	Aspects of drug modeling.
5	Computerized applications in drug modeling.
6	Modeling of Cimetidine, the prototypical H2-receptor antagonist. **Activity**
7	Modeling of atypical antipsychotics.

8	Modeling of Selective COX-2 inhibitor NSAIDs.
9	Modeling of Dorzolamide, a carbonic anhydrase inhibitor used to treat glaucoma.
10	Modeling of Enfuvirtide, a peptide HIV entry inhibitor.
11	Modeling of Nonbenzodiazepines like zolpidem and zopiclone.
12	Modeling of Probenecid. **Activity**
13	Modeling of SSRIs (selective serotonin reuptake inhibitors) a class of antidepressants.
14	Modeling of Zanamivir, an antiviral drug.
15	Revision & open discussion

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 6-12
Assessment (2): Written exam	Week 16
Assessment (3): oral exam	Week 16

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)
Leach, Andrew R in " *Structure-based Drug Discovery*".(2011)
C- Suggested books:
Schneider G, Fechner U in" *Computer-based de novo design of drug-like molecules*".(2012)
D- Websites: pubmed, Sciencedirect, Nejm,Weilyinterscience and wikepedia.

Facilities required for teaching and learning:

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

- **Course Coordinators:** Prof. Dr/ Mansour Abu-kul
- **Head of Department: Prof.Dr/ Mansour Abukull**
- **Date: 2012/9/3 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	Introduction to drug modeling.	x						
2	Principles of drug modeling.	x						
3	Different types of drug modeling.	x						
4	Aspects of drug modeling.		x					
5	Computerized applications in drug modeling.		x		x			
6	Modeling of Cimetidine, the prototypical H2-receptor antagonist. **Activity**			x			x	x
7	Modeling of atypical antipsychotics.			x				
8	Modeling of Selective COX-2 inhibitor NSAIDs.			x		x		
9	Modeling of Dorzolamide, a carbonic anhydrase inhibitor used to treat glaucoma.			x				
10	Modeling of Enfuvirtide, a peptide HIV entry inhibitor.			x				
11	Modeling of Nonbenzodiazepines like zolpidem and zopiclone.			x				
12	Modeling of Probenecid. **Activity**			x			x	x
13	Modeling of SSRIs (selective serotonin reuptake inhibitors) a class of antidepressants.			x				
14	Modeling of Zanamivir, an antiviral drug.			x				
15	Revision and open discussion	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.1- Demonstrate fundamental theoretical concepts and in-depth information of medicinal chemistry and their related subjects including computer- aided drug design, drug modeling and impurities analysis.	a1	Introduction to drug modeling. Principles of drug modelling. Different types of drug modelling.	Textbooks, Scientific papers and self learning	x	x	X	x	

	2.1.2- Fundamentals, methods, techniques, tools and ethics of scientific research.	A.2- Identify the possible mechanisms, techniques and theories present in papers.	a2	Aspects of drug modelling. Computerized applications in drug modelling.	Textbooks, Scientific papers and self learning	x	x	X	x	
	2.1.4- The principles and bases of quality assurance in professional practice in the field of specialization.	A.4- Confirm the principles and bases of quality assurance especially in pharmaceutical impurities in addition to drug design and modeling .	a3	Modeling of Cimetidine, the prototypical H2-receptor antagonist. Modeling of atypical antipsychotics. Modeling of Selective COX-2 inhibitor NSAIDs. Modeling of Dorzolamide, a carbonic anhydrase inhibitor used to treat glaucoma. Modeling of Enfuvirtide, a peptide HIV entry inhibitor. Modeling of Nonbenzodiazepines like zolpidem and zopiclone. Modeling of Probenecid. Modeling of SSRIs (selective serotonin reuptake inhibitors) a	Textbooks, Scientific papers and self learning	x	x	X	x	

				class of antidepressants. Modeling of Zanamivir, an antiviral drug.						
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- Evaluate data obtained from medicinal chemistry study e.g impurities and drug synthesis to use them in a suitable manner.	b1	Computerized applications in drug modelling.	Textbooks, Scientific papers and self learning	x	x	X	x	
	2.2.2- Propose solutions to specified problems in the light of the available data (information).	B.2- Analyze and solve chemistry based problems.	b2	Modeling of Selective COX-2 inhibitor NSAIDs.	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- Find information from a range of sources in the field of medicinal chemistry.	d2	Activity	Internet					x

Qualitative and Quantitative analysis of impurities in pharmaceutical preparations

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: 2012/2013

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 & develop suitable analytical methodology, 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	Clarify the different techniques of impurities analysis.
a2	Keep up-to-date with new methods, programs and theories in impurities analysis.
a3	Apply the theories and bases of quality assurance in pharmaceutical impurities analysis.
Intellectual skills	
b1	Statistically perform analysis method and interpret data obtained from impurities analysis by using suitable program.
b2	Choose a new 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 impurities analysis.
2	Principles of impurities analysis .
3	Different types of pharmaceutical impurities.
4	Aspects of impurities analysis .
5	Validation parameters in impurities analysis (specificity , linearity , range).
6	Validation parameters in impurities analysis (accuracy ,

	precision , detection limit , quantitation limit). **Activity**
7	Validation parameters in impurities analysis (robustness , ruggedness , system suitability test).
8	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. **Activity**
13	Rapid detection of Impurities in the fluoroquinolone lomefloxacin tablets.
14	Determination of Impurities in enalapril tablets.
15	Revision & open discussion

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 6-12
Assessment (2): Written exam	Week 16
Assessment (3): oral exam	Week 16

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: pubmed, Sciencedirect, Nejm,Weilyinterscience and wikepedia.

Facilities required for teaching and learning:

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

- **Course Coordinators:** Prof. Dr. Abd-Allah El-Shanawany
- **Head of Department: Prof.Dr/ Mansour Abukull**
- **Date: 2012/9/3 تم اعتماد 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 impurities analysis.	x						
2	Principles of impurities analysis .	x						
3	Different types of pharmaceutical impurities.	x						
4	Aspects of impurities analysis .		x					
5	Validation parameters in impurities analysis (specificity , linearity , range).		x		x			
6	Validation parameters in impurities analysis (accuracy , precision , detection limit , quantitation limit). **Activity**		x		x		x	
7	Validation parameters in impurities analysis (robustness , ruggedness , system suitability test).		x		x			
8	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. **Activity**			x			x	
13	Rapid detection of Impurities in the fluoroquinolone lomefloxacin tablets.			x				
14	Determination of Impurities in enalapril tablets.			x				
15	Revision & open discussion	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 their related subjects including computer- aided drug design, drug modeling and impurities analysis.	a1	Introduction to impurities analysis. Principles of impurities analysis . Different types of pharmaceutical impurities.	Textbooks, Scientific papers and self learning	x	x	X	x	

	2.1.2- Fundamentals, methods, techniques, tools and ethics of scientific research.	A.2- Identify the possible mechanisms, techniques and theories present in papers.	a2	Aspects of impurities analysis . Validation parameters in impurities analysis (specificity , linearity , range). Validation parameters in impurities analysis (accuracy , precision , detection limit , quantitation limit). Validation parameters in impurities analysis (robustness , ruggedness , system suitability test). Chemical purity & its control	Textbooks, Scientific papers and self learning	x	x	x	x	

	2.1.4- The principles and bases of quality assurance in professional practice in the field of specialization.	A.4- Confirm 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- Evaluate data obtained from medicinal chemistry study e.g. impurities and drug synthesis to use them in a suitable manner.	b1	Validation parameters in impurities analysis (specificity , linearity , range). Validation parameters in impurities analysis (accuracy , precision , detection limit , quantitation limit). Validation parameters in impurities analysis (robustness , ruggedness , system suitability test).	Textbooks, Scientific papers and self learning	x	x	x	x	
	2.2.2- propose solutions to specified problems in the light of the available data (information).	B.2- 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- 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- Find information from a range of sources in the field of medicinal chemistry.	d2	Activity	Internet					X

Selected topics in drug design

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: 2012/2013

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 the basics and aspects of drug design and perform an effective method for a given problem through computer associated drug design.

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

Knowledge and Understanding	
a1	Describe the theories of drug design.
a2	Know recent information, modes and methods in drug design.
a3	Confirm the theories and basics of QC specially in pharmaceutical drug design preparations.
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	Introduction to drug design.
2	Principles of drug design.
3	Different types of drug design.
4	Aspects of drug design.
5	Computerized applications in drug design.
6	Design of 5-HT3 antagonists . **Activity**
7	Design of Acetylcholine receptor agonists .
8	Design of Angiotensin receptor blockers .

9	Design of Bcr-Abl tyrosine kinase inhibitors .
10	Design of Cannabinoid receptor antagonists .
11	Design of CCR5 receptor antagonists .
12	Design of Cyclooxygenase 2 inhibitors . **Activity**
13	Design of Dipeptidyl peptidase-4 inhibitors .
14	Design of HIV protease inhibitors .
15	Revision & open discussion

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 6-12
Assessment (2): Written exam	Week 16
Assessment (3): oral exam	Week 16

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.

Facilities required for teaching and learning:

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

- **Course Coordinators:** Prof. Dr/ Mansour Abu-kul
- **Head of Department: Prof.Dr/ Mansour Abukull**
- **Date: 2012/9/3 تم اعتماد التوصيف بمجلس القسم بتاريخ**

Matrix I of selected topics in drug design (2012-2013)

Course Contents		ILOs						
		Knowledge and Understanding			Intellectual skills		General and Transferable skills	
		a1	a2	a3	b1	b2	d1	d1
1	Introduction to drug design.	x						
2	Principles of drug design.	x						
3	Different types of drug design.	x						
4	Aspects of drug design.		x					
5	Computerized applications in drug design.		x		X			
6	Design of 5-HT3 antagonists . **Activity**			x		x	x	x
7	Design of Acetylcholine receptor agonists .			x				
8	Design of Angiotensin receptor blockers .			x				
9	Design of Bcr-Abl tyrosine kinase inhibitors .			x				
10	Design of Cannabinoid receptor antagonists .			x				
11	Design of CCR5 receptor antagonists .			x				
12	Design of Cyclooxygenase 2 inhibitors . **Activity**			x			X	x
13	Design of Dipeptidyl peptidase-4 inhibitors			x				
14	Design of HIV protease inhibitors .			x				
15	Revision & open discussion	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.1- Demonstrate fundamental theoretical concepts and in-depth information of medicinal chemistry and their related subjects including computer- aided drug design, drug modeling and impurities analysis.	a1	Introduction to drug design. Principles of drug design. Different types of drug design.	Textbooks, Scientific papers and self learning	x	x	x	x	

	2.1.2- Fundamentals, methods, techniques, tools and ethics of scientific research.	A.2- Identify the possible mechanisms, techniques and theories present in papers.	a2	Aspects of drug design. Computerized applications in drug design.	Textbooks, Scientific papers and self learning	x	x	x	x	
	2.1.4- The principles and bases of quality assurance in professional practice in the field of specialization.	A.4- Confirm 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 Angiotensin receptor blockers . Design of Bcr-Abl tyrosine kinase inhibitors . Design of Cannabinoid receptor antagonists . Design of CCR5 receptor antagonists . Design of Cyclooxygenase 2 inhibitors . Design of Dipeptidyl peptidase-4 inhibitors . Design of HIV protease inhibitors .	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- Evaluate data obtained from medicinal chemistry study e.g. impurities and drug synthesis to use them in a suitable manner.	b1	Computerized applications in drug design.	Textbooks, Scientific papers and self learning	x	x	x	x	
	2.2.2- Propose solutions to specified problems in the light of the available data (information).	B.2- 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- 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- Find information from a range of sources in the field of medicinal chemistry.	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:** 2012/2013

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, 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. • esU 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:

1. **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/ Mansour Abukull**

Matrix of PhD Thesis (Medicinal Chemistry)				
NARS		Program ILOs	Thesis ILOs	Thesis content
Knowledge and Understanding	2.1.1- Fundamental and in-depth knowledge and basic theories in the field of specialty and the closely related areas of pharmaceutical sciences.	A.1- Demonstrate fundamental theoretical concepts and in-depth information of medicinal chemistry and their related subjects including computer- aided drug design, drug modeling and impurities analysis.	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.	• Collect all available information about this subject by all possible means.
	2.1.2- Fundamentals, methods, techniques, tools and ethics of scientific research.	A.2- Identify the possible mechanisms, techniques and theories present in papers.	Determine methods, tools and techniques used during work.	• Increase the awareness of the recent chemical and analytical techniques that will be used during practical work and determined by the protocol. • Identify different practical techniques and methods to assess chemical parameters related to the subject under study.

	2.1.3- The ethical and legal principles in pharmacy and academic practices.	A.3- Have the ability to interpret ethical and legal principles in academic practices.	Carry out professional duties in accordance with legal and ethical guidelines.	• Apply ethical recommendations in all aspects of scientific research e.g. citation, publication…… • Understand any legal aspects related to the thesis work especially those related to dealing with chemicals.
	2.1.4- The principles and bases of quality assurance in professional practice in the field of specialization.	A.4- Confirm the principles and bases of quality assurance especially in pharmaceutical impurities in addition to drug design and modeling.	Confirm the principles and bases of quality assurance especially in pharmaceutical impurities in addition to drug design and modeling.	· 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.
	2.1.5- All relevant knowledge concerning the impact of professional practice on society and environment and the ways of their conservation and development.	A.5- Identify the effect of the specified research on the environment and society.	Describe the purpose of the research work and its impact on the community and human health.	• 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.

Intellectual Skills	2.2.1- Analyze and evaluate the data in his\her specified area and utilize them in logical inference processes (induction/deduction).	B.1- Evaluate data obtained from medicinal chemistry study e.g impurities and drug synthesis to use them in a suitable manner.	Analyze and interpret the experimental data in a suitable form to utilize them properly.	• 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.
	2.2.2- Propose solutions to specified problems in the light of the available data (information).	B.2- Analyze and solve chemistry based problems.	Propose a solution to the point understudy depending on available data.	• Suggest solution to the problem understudy based on this presented data. • Integrate different knowledge (medicinal chemistry, organic chemistry, analytical chemistry ……..) to solve suggested problem.
	2.2.3- Conduct research studies that add to the current knowledge.	B.3- Explore new areas of research in various fields of chemistry and develop appropriate experimental design.	Explore new areas of research in various fields of chemistry and develop appropriate experimental design.	• 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. • Design the protocol including the steps of work following the suitable timetable.

	2.2.4- Formulate scientific papers.	B.4- Write scientific papers on the obtained results from the research.	Write scientific papers on the obtained results from the research.	• Write scientific reports on the obtained results with conclusive significance.
	2.2.5- Asses hazards and risks in professional practice in his \ her areas of specialization.	B.5- Recognize and avoid possible hazards during practical work.	Manage risks during dealing with chemical reagents.	• Evaluate and manage chemical hazards throughout the whole practical work.
	2.2.6- Plan to improve performance in the pharmaceutical area of interest.	B.6- Improve the performance by using new techniques and following a planned protocol to obtain new results.	Improve the performance during the practical work.	• Design the protocol including the steps of work following the suitable timetable. Suggest possible recommendations based on the outcome of the thesis and decide future plans. • Identify different practical techniques and methods to assess chemical parameters related to the subject under study.

	2.2.7- Take Professional decisions and bears responsibility in wide array of pharmaceutical fields.	B.7- Make effective decision in complex and unpredictable situations.	Make decisions related to recent and future studies.	•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. -Suggest possible recommendations based on the outcome of the thesis and decide future plans. - Use all possible means to prove target compounds.
	2.2.8- Be creative and innovative.	B.8- Try to introduce new ideas and applications in the field of impurities and drug synthesis.	Be creative, innovative and original in one's approach to research.	• Modify methods and experiments used during practical work.
	2.2.9- Manage discussions and arguments based on evidence and logic.	B.9- Discuss results very carefully and reject errors.	Discuss by theoretical evidences the whole work results.	• Communicate with supervisors to discuss results. • Present the results periodically in seminars.
Professional and Practical Skills	2.3.1- Master basic and modern professional skills in the area of specialization.	C.1- Perform standard laboratory procedures.	Perform practical experiments related to the point understudy.	• Increase the awareness of the recent chemical and analytical techniques that will be used during practical work and determined by the protocol. • Identify different practical techniques and methods to assess chemical parameters related to the subject under study. • Modify methods and experiments used during practical work.

	2.3.2- Write and critically evaluate professional reports.	C.2- Write with confidence reliable scientific reports in medicinal chemistry research .	Report the work in a written report.	• Write scientific reports on the obtained results with conclusive significance. • Summarize the thesis in an understandable Arabic language for non professionals. • Write references in the required form (Thesis, Paper…….).
	2.3.3- Evaluate and develop 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.	Select appropriate methods and tools to support goals.	• Identify different practical techniques and methods to assess chemical parameters related to the subject under study. • Modify methods and experiments used during practical work. • Operate scientific instruments according to instructions.
	2.3.4- Properly use technological means in a better professional practice.	C.4- Use available technologies either in softwares or instruments in the professional work.	Consider developments in technology and how to use to enhance learning.	• 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. • Present the results periodically in seminars • Demonstrate the thesis in a final power point presentation.

	2.3.5- Plan to improve professional practice and to improve the performance of other scholars.	C.5- Search for newest programs in data analysis and help other scholars to use.	Improve the performance during the practical work.	• Modify methods and experiments used during practical work. • Design the protocol including the steps of work following the suitable timetable. -Suggest possible recommendations based on the outcome of the thesis and decide future plans. • Use new programs for data analysis.
General and Transferable Skills	2.4.1- Effective Communication in its different forms.	D.1-Communicate clearly in oral, written and non verbal form.	Communicate effectively in different forms.	• Communicate with supervisors to discuss results. • Present the results periodically in seminars.
	2.4.2- Effective use of information technologies to improve professional practices.	D.2- Use professional softwares and computer skills to improve performance.	Be competent in the use of computers for data analysis, word-processing, and production of thesis-quality graphics.	• Use internet, journals, books and others thesis to get previous and recent information about the subject understudy. • Use new programs for data analysis. • Perform statistical analysis and chemical correlation for the results. • Present and describe the results graphically.

	2.4.3- Help others to learn and evaluate their performance.	D.3- Evaluate others achievement and help them to develop their performance.	Evaluate the performance of others and assist them to develop.	• Discuss obtained results in comparison with pervious literatures.
	2.4.4- Self-assessment and continuous learning.	D.4- Be lifelong learners and stay informed of the professional field.	Recognize self-limitations and areas for improvement and seek for continuous learning.	• Continuous evaluation to the thesis outcome according to the schedule. • Continue self-learning throughout the experimental work and writing scientific papers.
	2.4.5- Use various sources to get information and knowledge.	D.5- Use a variety of resources to investigate topics of interest including libraries, databases and internet.	Gather, summarize, and organize information from different sources.	• Use internet, journals, books and others thesis to get previous and recent information about the subject understudy.
	2.4.6- Work as a member and lead a team of workers.	D.6- Function positively as a member of a team.	Implement tasks as a member of a team.	• Work effectively as a member of a team (e.g. Supervisors and various professionals).
	2.4.7- Direct scientific meetings and to manage time effectively.	D.7- Get maximum use of time to achieve goals through hard work and attending scientific meetings.	Utilize time effectively to achieve goals.	• Organize the experimental work according to the designed protocol.