Academic Reference Standards (ARS)
for
Master in Pharmaceutical Sciences
(*Pharmaceutical Organic Chemistry*)

Pharmaceutical Organic Chemistry Department

ARS

Academic Year: 2021/2022

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The Academic Reference Standard (ARS) for master of Pharmaceutical Sciences (Pharmaceutical Organic Chemistry) regarding attributes and capabilities of the graduates were based essentially on the General Academic Reference Standard of graduate studies published by the National Authority for Quality Assurance and Accreditation of Education (NAQAAE, 2009).

Academic Reference Standards of Master of Pharmaceutical Sciences (Pharmaceutical Organic Chemistry)

General Attributes of the Graduate

The graduates of the Master of Pharmaceutical Sciences (Pharmaceutical Organic Chemistry) should be capable of:

a. Applying the basics and methodologies of scientific research and manipulating its various tools in the field of Pharmaceutical Organic Chemistry.
b. Mastering of advanced knowledge, professional research skills, attitudes and values in the field of Pharmaceutical Organic Chemistry and integrating with the relevant subjects in his/her professional practice.
c. Recognizing the current issues in drug synthesis and/or structural elucidation.
d. Adopting the scientific thinking approaches in subjects relevant to drug design and/or drug synthesis.
e. Identifying and solving problems in the field of organic chemistry
f. Mastering adequate range of specialized professional skills and using appropriate technology to improve his/her professional practice.
g. Communicating effectively and having ability to participate and lead teamworks.
h. Taking appropriate professional and scientific decisions in light of the available information.
i. Providing the ability to critically analyze the impact and outcomes of research results.
j. Training in ethical and legal aspects of scientific research.
k. Employing the available resources to achieve and preserve the maximum benefit.
l. Exhibiting awareness of his/her role in the community development and preservation of environment in response to regional global changes.
m. Reflecting commitment to integrity, credibility and rules of the pharmacy profession.
n. Developing continuous self-academic and professional learning.

General Standards

1. Knowledge and Understanding:

Upon successful completion of the Program, graduates should be able to:

1.1 Identify the theories and fundamentals of organic chemistry and other related fields.
1.2 Recognize the recent and advanced scientific developments in the field of pharmaceutical organic chemistry.
1.3 Detect all basic and new techniques used in the field of drug design and/or drug synthesis.
1.4 Distinguish the value of ethics and legal issues of research and professional practice in pharmaceutical organic chemistry.
1.5 Identify principles and fundamentals of quality in professional practice in the field of drug synthesis and/or drug structural elucidation.
1.6 Illustrate the mutual interaction between the pharmaceutical professional practice and the surrounding environment.

2. Intellectual Skills

Upon successful completion of the Program, graduates should be qualified to:

2.1 Analyze and evaluate information in the field of pharmaceutical organic chemistry
2.2 Deduce solutions for specialized problems in absence of some information
2.3 Integrate information to solve professional problems.
2.4 Develop methodological scientific studies on certain research problems.
2.5 Assess risk assessment of professional practice organic chemistry.
2.6 Plan for development in pharmaceutical and organic chemistry.
2.7 Generate professional decision in response to various professional contexts.

3. Professional and Practical Skills

Upon completion of the program, graduates should be able to

3.1 Master basic and professional skills in pharmaceutical and organic chemistry and related fields.
3.2 Assess methods and techniques used in drug design and synthetic organic chemistry.
3.3 Write and evaluate professional research reports in synthetic organic chemistry.

4. General and transferable skills:

Upon completion of the program, graduates should be able to:

4.1 Communicate effectively by various methods
4.2 Utilize effectively information technology in professional practice development.
4.3 Perform self-assessment, continuous learning and identifying personal educational needs.
4.4 Use different resources to acquire knowledge and information.

4.5 Anticipate needs and risks in the research fields.
4.6 Work in a team and lead others in various professional contexts.
4.7 Manage time effectively.
4.8 Interpret and evaluate data available from scientific research.

Show awareness of ethics and legal issues of research and professional practice in pharmaceutical organic chemistry

Department Council Approval on 8/12/2021
Faculty Council Approval on /5/2022

Program: Master in Pharmaceutical Sciences (*Pharmaceutical Organic Chemistry*)

Pharmaceutical Organic Chemistry Department

Program Specification

Academic Year: *2021/2022*

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A-Basic Information

1	**Faculty**	**Pharmacy**
2	**Program Title:**	**Master in Pharmaceutical Sciences (*Pharmaceutical Organic Chemistry*)**
3	**Program Type:**	**Single**
4	**Department (s):**	**Department of Pharmaceutical Organic Chemistry**
5	**Final award:**	**Master degree in Pharmaceutical Organic Chemistry**
6	**Coordinator:**	**Prof. Dr. Shahenda Metwally El-Messery**
7	**External Evaluator(s):**	
8	**Date of Program Specification Approval:**	***Department council: 11/3/2021*** ***Faculty council: 20/3/2021***

B-Professional Information

1-Program Aims

Upon successful completion of the program, graduates should demonstrate comprehensive knowledge, clear understanding and outstanding skills in pharmaceutical sciences and Pharmaceutical Organic Chemistry.

1.1 Mastering of advanced knowledge, professional research skills, attitudes and values in the field of pharmaceutical organic chemistry and integrating with the relevant subjects in his/her professional practice.

1.2 Applying the basics and methodologies of scientific research and manipulating its various tools in the field of pharmaceutical chemistry.

1.3 Master practical research procedures according to the good laboratory practice (GLP) basics in chemistry labs and perform experiments with safety guidelines.

1.4 Mastering of all traditional and new techniques used in the field of drug synthesis and/or discovery.

1.5 Applying the scientific thinking approaches and problem based learning in subjects relevant to drug development and/or drug discovery.

1.6 Formulating hypotheses based on current concepts in organic/medicinal chemistry field.

1.7 Designing and conducting research projects.
1.8 Analyze and interpret results and information acquired from primary literature sources.
1.9 Manipulate computer program, online database, software and other IT skills to get information and analyze the obtained research data.
1.10 Attaining communication skills, research ethics, time management, decision-making, and team working.

2-Intended Learning Outcomes (ILOs)

A- Knowledge and Understanding:

By the end of this program the graduate should be able to:

A1	Discuss the theories and fundamentals of instrumental analysis, statistics and biostatistics, physical chemistry and bioinformatics
A2	Explain the theories and fundamentals of drug development, design, synthesis, structural elucidation, and pharmacokinetics and the relevant subjects of pharmaceutical synthetic chemistry.
A3	Recognize the current problems, the recent and advanced scientific development of drug design, synthesis, and structural elucidation.
A4	Utilize effectively all basic and recent techniques and technological tools used in the field of drug synthesis and/or computer-aided drug design.
A5	Identify the legal and ethical issues of research and professional practice in organic chemistry.
A6	Define the principles and the basics of quality in professional practice in the fields of pharmaceutical/synthetic chemistry
A7	Identify appropriate types of data needed to tackle a certain research problem

B- Intellectual Skills

By the end of this program the graduate should be able to:

B1	Analyze and evaluate the gained information in the field of spectroscopic analysis, organic chemistry, computational chemistry, bioinformatics and drug design.
B2	Demonstrate logic and critical way of thinking to suggest solutions for scientific and professional problems according to accompanying circumstances and causes.
B3	Demonstrate creativity and innovative scientific and professional approaches regarding synthetic/organic chemistry.
B4	Utilize the available professional and scientific resources and research skills to solve problems
B5	Assess professional and scientific risks in practicing drug synthesis and/or drug structural elucidation
B6	Plan to improve performance and research in the field of asymmetric/enantioselective chemistry
B7	Interpret and validate the obtained research data
B8	Recommend professional and scientific decisions based on proofs, evidences and available data

B9	Participate in comprehensive scientific and professional discussions and communications based on scientific evidences and proofs
B10	Analyze and evaluate the gained information in the field of instrumental analysis, biostatistics, physical chemistry, bioinformatics and drug development.

C- Professional and Practical Skills

By the end of this program the graduate should be able to:

C1	Apply different synthetic methods for assembly drug-like compounds.
C2	Develop different research methodologies and good experimental and reporting skills in the design, synthesis and elucidation of structure of pharmaceutically-relevant organic compounds
C3	Manage safely and efficiently advanced technological research tools and equipments relevant to drug synthesis, and molecular modeling research
C4	Outline and illustrate the calculations of the heat of the reaction, neutralization, combustion ….etc of a chemical reaction
C5	Draw 2D and 3D structures of biologically active compounds using computer software
C6	Write accurately, evaluate professional reports and publish scientific research papers in scientific journals and conferences
C7	Write thesis in a scientific and precise way
C8	Illustrate the effect of his/her professional practice on the community in addition to different methods of environmental development and maintenance

D. General and Transferable Skills

By the end of this program the graduate should be able to:

D1	Communicate clearly by verbal and written means
D2	Manipulate computer program, online database, software and other IT to get information and analyze the obtained research data
D3	Practice self- assessment and learning needed for continuous professional development
D4	Utilize different available information resources relevant to synthetic/organic chemistry
D5	Promote critical thinking, problem-solving and decision-making capabilities
D6	Deal with obstacles and problems
D7	Work effectively in a team and offer expertise and advice to others
D8	Develop creativity and time management abilities
D9	Evaluate and criticize scientific work, literature and research data
D10	Adopt ethical, legal, professional responsibilities and safety guidelines
D11	Develop presentation skills, give seminars and defend thesis in public

3-Academic Reference Standards (ARS):

Approved by both the department and faculty councils

Department Council Approval Date 9/8/2016
Faculty Council Approval Date: 21/8/2016

3a- Academic References Standards: (Attached)

3b-Comparison of provision to External References

Achievement of academic reference standards via program Intended Learning Outcomes.

ILOs	ARS	Program
1. **Knowledge and Understanding**	**1.1**	A1, A2
	1.2	A3
	1.3	A4
	1.4	A5
	1.5	A6
	1.6	A6, A7
2. **Intellectual Skills**	**2.1**	B1
	2.2	B2
	2.3	B2, B4, B7
	2.4	B4
	2.5	B5
	2.6	B3, B6
	2.7	B8
3. **Professional and Practical Skills**	**3.1**	C4, C3
	3.2	C1, C2, C3
	3.3	C6, C7, C8
4. **General and Transferable Skills**	**4.1**	D1
	4.2	D2
	4.3	D3
	4.4	D4
	4.5	D5, D6
	4.6	D7
	4.7	D8
	4.8	D9
	4.9	D10

4-Curriculum Structure and Contents

4A. Program duration: 18 months from the date of registration -5 years.

4B. Program structure:

a- The program consists of 46 credit hours of study (16 credit hours of courses and 30 credit hours for thesis).

b. The program includes 16 credit hours graduate courses. These courses include 8 credit hours of general required courses of the faculty requirement, in addition to 8 credit hours of special required

(6 credit hours) and special elective (2 credit hours) courses. The courses will possess the code [200] according to Faculty By-Law.

c. A scientific research thesis of 30 credit hours represent a main component of the program. It is achieved in a subject assigned by the supervision committee, endorsed by the Department Council, the committee of graduate studies & research and the Faculty Council.

d. The student should publish at least one scientific research paper in scientific journals before the public defense of the Thesis.

4c. Program Components

1- Courses according to the By-law

Code number	Name of the course	Type	Credit Hours	Semester
GCM-201	Instrumental Analysis	**General** Compulsory	2	Fall
GCM-202	Biostatistics	**General** Compulsory	2	Fall
GCM-203	Physical chemistry	**General** Compulsory	1	Fall
GCM-204	Bioinformatics	**General** Compulsory	1	Fall
GCM-205	Research Methodology & Ethics	**General** Compulsory	1	Fall
GCM-206	Scientific writing and Seminar	**General** Compulsory	1	Fall
POM-201	Advanced Organic Chemistry	**Special** Compulsory	2	Spring
POM-202	Heterocyclic Chemistry	**Special** Compulsory	2	Spring
POM-203	Structural Elucidation of Drugs	**Special** Compulsory	2	Spring
POM-204	Molecular Modeling and Drug Development	**Special** elective	2	Spring
POM-205	Stereochemistry of Drugs	**Special** elective	2	Spring
Total (Courses)			16	
	Thesis		30	
Total			46	

2- Achievement of Program Intended Learning Outcomes by its components

Course	C.H/ week	Program ILOs (by No.)			
		K.U*	IS**	P.P.S***	G.T.S****
First Semester - *General Courses (8 C.H.)*					

Instrumental Analysis ***(GCM-201)***	**2**	A1	B2, B10	C2, C3	D1, D3, D5
Statistics and biostatistics (GCM-202)	**2**	A1	B2, B7, B10	C1	D1, D2, D3, D5
Physical chemistry (GCM-203)	**1**	A1	B2, B10	C4	D1, D3, D5
Bioinformatics (GCM-204)	**1**	A1	B2, B4, B10	C5	D1, D3, D5, D9
Research Methodology & Ethics (GCM-205)	**1**	A5	B5	C2, C3, C8	D1, D3, D5, D10
Scientific writing and Seminar (GCM-206)	**1**	A7	B6, B7, B8, B9	C6, C7	D1, D3, D5, D9, D11
Total	**8**				
Second Semester - ***Special Courses (8 C.H.)***					
Advanced Organic Chemistry (POM-201)	**2**	A2, A3	B1, B2, B3, B4, B9	C2, C6	D1, D2, D3, D4, D5
Heterocyclic Chemistry (POM-202)	**2**	A2	B2, B3, B4, B9	C6	D1, D2, D3, D4, D5
Structural Elucidation of Drugs (POM-203)	**2**	A2	B2, B3, B4, B7, B9	C2, C6	D1, D2, D3, D4, D5
Molecular Modeling and Drug Development (POM-204) (elective)	**2**	A2, A3	B2, B3, B4, B5, B9	C2, C6	D1, D2, D3, D4, D5
Stereochemistry of Drugs (POM-205) (elective)	**2**	A2, A3	B2, B3, B4, B9	C2, C6	D1, D2, D3, D4, D5
Total	**8**				
Thesis	**30**	A4, A5, A6	B2, B3, B4, B5, B6, B7, B8, B9	C1, C2, C3, C4, C5, C6, C7, C8	D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11
Total	**46**				

* ***K**nowledge and **U**nderstanding*
** ***I**ntellectual **S**kills*
*** ***P**rofessional and **P**ractical **S**kills*
**** ***G**eneral and **T**ransferable **S**kills*

Code	Course title	P.P.S***	G.T.S****

Code	Course title	K.U*							IS**									
		A1	A2	A3	A4	A5	A6	A7	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
GCM-201	Instrumental Analysis	√								√								√
GCM-202	Biostatistics	√								√					√			√
GCM-203	Physical chemistry	√								√								√
GCM-204	Bioinformatics	√								√		√						√
GCM-205	Research Methodology & Ethics					√							√					
GCM-206	Scientific writing and Seminar							√						√	√	√	√	
POM-201	Advanced Organic Chemistry		√	√					√	√	√	√					√	
POM-202	Heterocyclic Chemistry		√							√	√	√					√	
POM-203	Structural Elucidation of Drugs		√							√	√	√			√		√	
POM-204	Molecular Modeling and Drug Development **(E)**		√	√						√	√	√	√				√	
POM-205	Stereochemistry of Drugs **(E)**		√	√						√	√	√					√	
Thesis					√	√	√			√	√	√	√	√	√	√	√	

		C1	C2	C3	C4	C5	C6	C7	C8	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11
GCM-201	Instrumental Analysis		√	√						√		√		√						
GCM-202	Biostatistics	√								√	√	√		√						
GCM-203	Physical chemistry				√					√		√		√						
GCM-204	Bioinformatics					√				√		√		√				√		
GCM-205	Research Methodology & Ethics		√	√					√	√		√		√					√	
GCM-206	Scientific writing and Seminar						√	√		√		√		√				√		√
POM-201	Advanced Organic Chemistry		√				√			√	√	√	√	√						
POM-202	Heterocyclic Chemistry						√			√	√	√	√	√						
POM-203	Structural Elucidation of Drugs		√				√			√	√	√	√	√						
POM-204	Molecular Modeling and Drug Development **(E)**		√				√			√	√	√	√	√						
POM-205	Stereochemistry of Drugs **(E)**		√				√			√	√	√	√	√						
Thesis		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

*	***K**nowledge and **U**nderstanding*
**	***I**ntellectual **S**kills*
***	***P**rofessional and **P**ractical **S**kills*
****	***G**eneral and **T**ransferable **S**kills*
E	***E**lective course*

6- Student Assessment Methods

6.1- Written exam (general and special courses).	To assess Knowledge and Understanding and Intellectual Skills
6.2- Oral exam (general and pecial courses).	To assess Knowledge and Understanding, Intellectual Skills and General and transferable Skills
6.3- Scientific seminar for thesis registration	To assess Knowledge and Understanding, Intellectual Skills and General and transferable Skills
6.4- Published scientific research paper.	Knowledge and Understanding, Intellectual Skills, Professional and practical Skills
6.5- Thesis writing	Knowledge and Understanding, Intellectual Skills, Professional and practical Skills & General and Transferable Skills
6.5- Public presentation and discussion of the thesis.	Knowledge and Understanding, Intellectual Skills, Professional and practical Skills & General and Transferable Skills

7- Program Admission Requirements

7.1- The candidate should hold a bachelor degree in pharmacy from any faculty of pharmacy from Egypt or Arabian countries or foreign universities recognized by the Supreme Council of Universities recognized by the Supreme Council of Universities with minimum general grade of "**Good**". Candidates having Diploma in the area of specialty are preferred. It is possible to enroll foreign students with general grade "**Good**".

7.2- The candidate should be available for study at least two days per week throughout the duration of study.

7.3- The candidate should possess at least grade "**Good**" in the subject of the specialty.

7.4- The department council starts the registration process for the candidate after his/her successful passing of the general courses of the first semester.

7.5- The candidate should follow postgraduate rules of by-law (**2014**) and its modified by-law **(2017)** of Faculty of Pharmacy-Mansoura University.

8- Regulations for progression and program completion

8.1- The minimum duration of time to gain the master degree is two years from the date of enrollment or 18 months from the date of registration of the master thesis.

8.2- The maximum duration of time to gain the master degree is 5 years from the date of registration, putting in consideration the periods of enrollment suspension. It is possible to extend this period up to two years (one year at a time) based on a request from the candidate's

major supervisor, a suggestion from the department council and the committee of graduate studies & research and the approval of the faculty council. The final decision should be endorsed by the university council of graduate studies & research.

8.3- The student has to pass the assigned courses, and to practically do a scientifc research thesis for complete fulfilment of the master degree.

8.4- An annual progress report is presented by the supervisors of thesis to the department Council by December.

8.5- The candidate should follow postgraduate rules of by-law (**2014**) and its modified by-law **(2017)** of Faculty of Pharmacy-Mansoura University.

9. Facilities Required for Search: Computers.

9.2- Computer software for drug design and molecular modeling.

9.3- Library and digital library supplied by recent scientific books and journals.

9.4- Laboratories with enough chemicals, apparatus and advanced instruments.

9.5- Access to research engines for scientific periodicals in the field of pharmaceutical organic chemistry.

10-Thesis

A thesis should be prepared by the student for complete fulfillment of the master degree.

11- Evaluation of program

Evaluator	Method	Sample
Internal evaluator	Program evaluation Courses evaluation	Program report Courses report
External evaluator	Program evaluation Courses evaluation	Program report Courses report
Stakeholders	Questionnaires	To be Attached
Postgraduates	Questionnaires	To be Attached
Self-evaluation	Matrices	To be Attached
Supervisors of Thesis	Reports	Reports of staff members of committee to evaluate the thesis

Program Coordinator: Prof. Dr. Shahenda Metwally El-Messery

Head of Department: Prof. Dr. Shahenda Metwally Elmessery

Signature:

Annex: ***Attach courses and thesis specifications.***

Program: Master in Pharmaceutical Sciences (*Pharmaceutical Organic Chemistry*)

Pharmaceutical Organic Chemistry Department

Master Thesis Specification

Academic Year: 2021/2022

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A-Basic Information

1	**Faculty**	**Pharmacy**
2	**Program Title:**	**Master in Pharmaceutical Sciences** (*Pharmaceutical Organic Chemistry*)
3	**Program Type:**	**Single**
4	**Department (s):**	**Pharmaceutical Organic Chemistry Department**
	Total credits of the Thesis	**42 C. H.**
	Total credits of the Program	**50 C.H.**
5	**Final award of the Program:**	**Master degree of Pharmaceutical Sciences (Pharmaceutical Organic Chemistry)**
6	**Coordinator:**	**Prof. Dr. Shahenda Metwally El-Messery**
7	**External Evaluator(s):**	-
8	**Date of Program Specification Approval:**	***Department council: 11/3/2021,*** ***Faculty council: 20/3/2021***

B-Professional Information

1-Aims

The overall aims of the thesis:

1.1 Knowing the basics and new methodologies of scientific research

1.2 Utilize the traditional and new techniques used in the field of drug synthesis and/or discovery.

1.3 Recognize practical research procedures according to the good laboratory practice

2-Intended Learning Outcomes (ILOs)

a- Knowledge and Understanding:

Upon successful completion of the thesis, the graduate should be able to efficiently demonstrate the essential knowledge and understanding of:

a1	Discuss the theories and fundamentals of drug development, design, synthesis, structural elucidation
a2	Recognize effectively all basic and recent techniques and technological tools used in the field of drug synthesis and/or computer-aided drug design
a3	Identify the current problems and advanced scientific development of drug design, synthesis, and structural elucidation

b- Intellectual Skills

By the end of this thesis, the graduate should be able to:

b1	Interpret and validate the obtained biological and structural research data
b2	Design appropriate methods of isolation, synthesis, purification, identification of various pharmaceutical compounds
b3	Demonstrate innovative scientific and professional approaches regarding synthetic/organic chemistry.

c- Professional and Practical Skills

By the end of this thesis, the graduate should be able to:

c1	Apply different synthetic methods for development of biologically active compounds.
c2	Write accurately, evaluate professional reports and publish scientific research papers in scientific journals and conferences
c3	Write thesis in a scientific and precise way
c4	Outline and illustrate the conditions of chemical reaction

d. General and Transferable Skills

By the end of this thesis, the graduate should be able to:

d1	Work effectively in a team and offer proficiency and advice to others.
d2	Promote decision-making, critical thinking, and problem-solving
d3	Apply ethical, legal, professional responsibilities and safety guidelines
d4	Acquire presentation skills, give seminars and defend thesis in public

3- Thesis Contents:

Part	Topics
1	Abstract (Arabic and English)
2	Introduction
3	Aims, Objectives and Rational of the work
4	Results and Discussion, covering all fields
5	Methodology and Experimental Work of all fields
6	Conclusion
7	References

4- Matrix of knowledge and skills of the Thesis:

Part	Topics	Course ILOs			
		K.U*	IS**	P.P.S***	G.T.S****
2	Introduction	a1,	b3	c2, c3	d1, d2, d3,d4
3	Objectives/Rational	a3	b1, b2, b3	c1, c4	d1, d2, d3,d4
4	Results and Discussion	a1, a2, a3	b1, b2, b3	c2	d1, d2, d3,d4
5	Experimental Work	a2	b1	c1, c2, c3	d1, d2, d3,d4
6	Conclusion	a1, a2, a3	b3	c3	d1, d2, d3,d4

* ***K**nowledge and **U**nderstanding* ***I**ntellectual **S**kills* ****P**rofessional and **P**ractical **S**kills* *****G**eneral and **T**ransferable **S**kills*

5. Student Assessment:

A written Thesis	
Published Research Paper(s)	
Public Defense	
Committee-in-Charge Report	
Dept Council Approval	

Guidelines of the Thesis (according to By-Law).

1- The minimum period for obtaining a Master is two years from the date of enrolment and 18 months from the date of approval of the University's Graduate Studies Council for registration.

2- The maximum limit for obtaining a doctoral degree is five years from the date of registration, taking into account cases of suspension of registration, and registration may be extended upon the request of supervisors and the approval of the relevant department council, the Graduate Studies and Research Committee, and the College Board for an academic year with a maximum of two years.

3- The student must pass the English Language Examination with the minimum score specified by the University Studies Board to approve the Master defense date.

4- The number of credit hours for obtaining a master's degree is 46 hours (16 course hours - 30 credit hours per thesis). The student studies courses of at least 16 credit hours of postgraduate courses from code [200], including compulsory general courses (8 credit hours) as the college requirements and compulsory and optional specialized courses (8 credit hours).
5- The student conducts a research on a topic determined by the supervisory committee and approved by the relevant department council and the college, graduate studies and research councils.
6- The researcher submits, before registering for the academic degree, the research plan in a public discussion in the department to discuss the topic of the thesis, determine the objectives of the research, the extent of its application, potential problems and how to overcome them.

7- The scientific thesis is the responsibility of the relevant department council and is accomplished scientifically and technically under the responsibility of the supervisory committee. Scientific, technical and administrative support must be provided to the researcher for its completion, and the supervision committee is formed as follows:
8- The College Council, upon the proposal of the relevant Department Council, appoints a professor who supervises the thesis (principal supervisor). The council may entrust the supervision of the thesis to one of the assistant professors.
9- It is permissible for the supervisors to be many professors or assistant professors, and teachers may participate with a maximum of one in the same specialty.
10- A member from abroad who has experience in the specialty to which the dissertation belongs may be joined to the supervision committee.
11- The student should meet his main supervisor at least once monthly and a semi-annual report must be provided by the supervisor(s) on the progress of student to the department council and the Graduate Studies Committee and the graduate should be given a copy of the report. The annual report must be submitted to the college council in October each year.
12- A postgraduate student registered to obtain a master's degree or a doctorate degree, after completing the thesis preparation, holds a public discussion session on the thesis summary and the results he reached, during which the supervisors determine the extent to which the student fulfills the research point before submitting the thesis to the department council.
13- The principal supervisor submits an application that includes a proposal to form a discussion committee and judge the thesis after preparing it and preparing it for discussion in preparation for presentation to the Postgraduate Studies and Research Committee and then the College Board for approval and is supported by the following:
14- The report on the validity of the dissertation for discussion, signed by the majority of the members of the supervisory committee, one of whom is the main supervisor.
15- A copy of the thesis prepared according to the instructions for writing scientific theses in the faculty.
16- At least one research published in a scientific refereed journal.
17- The committee for discussion and judgment on the dissertation is formed of three members based on the proposal of the relevant department council, the graduate studies and research committee, and the approval of the college council, one of whom is the main supervisor or two members with one vote. And two other members from among the professors or assistant professors, at least one of them is from outside the college for master's theses, and at least one of them is from outside the University for Doctoral Theses (the two are from outside the college) according to the text of Article 153 of the Universities Organization Law.

18- The department council approves the individual reports, the group report, and what indicates that the student has made the proposed amendments from the discussion and judgment committee and submitted them to the Graduate Studies and Research Committee and the College Board in preparation for presentation to the University Council.
19- The date of awarding the academic degree is the date on which the University Council approved the College Board's recommendation for grants.
20- The college council, based on the proposal of the discussion and judgment committee, may return the message to the student to correct the errors and complete what the committee deems short of or submit another message in case the thesis is rejected.

6 – Facilities Required:

Laboratory	**Chemicals, apparatus and advanced instruments**
Library	**Scientific books and journals**
Others	

Thesis Coordinator	Head of Department	Date
Prof. Dr. Shahenda Metwally El-Messery	Prof Dr. Shahenda Metwally Elmessery	11 / 3 / 2021

* Date of Dept. Council Approval

Dept. of Pharm. Org. Chem	Course Specification	Master Program

Master in Pharmaceutical Sciences (Pharmaceutical Organic Chemistry)

Course Specification

Academic year: 2021/2022

البرنامج	توصيف مقرر
Master in Pharmaceutical Sciences	Advanced Organic Chemistry

رئيس القسم	منسق المقرر
أ د. شاهنده متولي المسيري	فاطمة النبويه السيد جوده

General

University	Mansoura
Faculty	Pharmacy
Department offering the course	Pharmaceutical Organic Chemistry
Department supervising the course	Faculty of pharmacy
Program on which the course is given	Master in Pharmaceutical Sciences
Academic Level	Post-Graduate Level
Academic year	2021/2022 - Second semester
Date of course specification approval	9/2/2022

A. Basic Information :Course data :

Course Title	Advanced Organic Chemistry
Course Code	POM-201
Prerequisite	------
Teaching Hours: Lecture	2
Total Credit Hours	2

B. Professional Information

1- Overall Aims of Course:

The course is designed to discuss some new reactions and mechanisms in organic chemistry with special emphasis onreactions related to synthesis of pharmaceutical compounds. As pericyclic reactions, Radical and carbene reactions,The Role of Protective Groups in Organic Synthesis.

2- Intended Learning Outcomes (ILOs)

a. *Knowledge and Understanding*

After completion of the course, graduates will be able to

a1	Explain the theories and fundamentals of chemical reactions.
a2	Recognize the current problems, the recent and advanced techniques in chemical reactions
a3	Define the principles of reactions mechanisms.
a4	Explain the effect of stereochemistry on drug synthesis.

b. Intellectual Skills

After completion of the course, graduates will be able to

b1	Analyze and evaluate the information in the field of organic reactions.
b2	Predict possible mechanisms for certain reactions.
b3	Examine the effect of stereochemistry on the chemical reactions.

c. Professional and Practical Skills

After completion of the course, graduates will be able to

c1	Prescribe a case history of synthesis of a Diels-Alder product.
c2	Relate the drug stereochemistry to reaction mechanism and final products.

d. General and Transferable Skills

After completion of the course, graduates will be able to

d1	Practice self- assessment and learning needed for continuous professional development.
d2	Promote critical thinking, problem-solving and decision-making.
d3	Work effectively in a team and offer expertise and advice to others.
d4	Develop creativity and time management abilities.

3. Course Contents

Week No.	Lecture Topics	Hours
1	Introduction to reaction mechanisms	2
2	Introduction to pericyclic reactions	2
3	Diels Alder reaction	2
4	Examples of Diels Alder reactions	2
5	Sigmatropic reactions	2
6	Electrocyclic reactions	2
7	Radical reactions	2
8	Carbene reactions	**2**
9	Protecting groups in organic synthesis	**2**

10	Selecting the protecting group	**2**
11	General revision	**2**
Total 11 weeks		**22**

4- Matrix of knowledge and skills of the course (contents versus ILOsof the course)

Week	Topics	Course ILOs			
		K.U*	IS**	P.P.S***	G.T.S****
1	Introduction to reaction mechanisms	a1, a2	b1	c2	d1, d2,d3, d4
2	Introduction to pericyclic reactions	a1, a2	b1	c2	d1, d2,d3, d4
3	Diels Alder reaction	a2, a3, a4	b1	c1, c2	d1, d2,d3, d4
4	Examples of Diels Alder reactions	a2, a3, a4	b2, b3	c1, c2	d1, d2,d3, d4
5	Sigmatropic reactions	a2, a3, a4	b2, b3	c2	d1, d2,d3, d4
6	Electrocyclic reactions	a2, a3, a4	b2, b3	c2	d1, d2,d3, d4
7	Radical reactions	a2, a3, a4	b2, b3	c2	d1, d2,d3, d4
8	Carbene reactions	a2, a3, a4	b2, b3	c2	d1, d2,d3, d4
9	Protecting groups in organic synthesis	a2, a3, a4	b2, b3	c2	d1, d2,d3, d4
10	Selecting the protecting group	a2, a3, a4	b2, b3	c2	d1, d2,d3, d4
11	General revision	a2, a3, a4	b2, b3	c2	d1, d2,d3, d4

** Knowledge and Understanding* ***Intellectual Skills***Professional and Practical Skills*
*****General and Transferable Skills*

5- Teaching and Learning Methods:

5.1	**Lecturesusing Power Point**(PPT) presentations
5.2	**Lectures using whiteboard**
5.3	**Video-recorded lectures**, uploaded to the University Portal for Online learning
5.4	Activities and **tasks required to develop students' self-learning skills**.
5.5	**Tutorial**, **Class Activity** and **Group Discussion** to explain what has not been understood
5.6	**Interactive Sessions** using Microsoft Teams

6- Student Assessment:

	Assessment Methods		**Assessment Schedule**	**Weighing of Assessments**
Assessment 1	**Written Exam (Final)**	Paper exams that are corrected electronically and/or manually. To assess understanding, intellectual, professional skills	weeks 14-15	90

Assessment 2	**Oral Exam**	To assess understanding, intellectual skills, General and Transferable skills	weeks 14-15	10
				100 %

7- List of References

	Reference	Type
1.	Organic chemistry 2nd ed., Jonathan Clayden, Nick Greeves, and Stuart Warren **(2012)**.	**Text Books**
2.	Organic chemistry 8th ed., Francis A. Carey, Robert M. Giuliano (**2011**).	**Text Books**
3.	Name Reactions: a Collection of Detailed Reaction Mechanisms, Jie Jack Li **(2006)**.	**Text Books**
4.	http:// www.pubmed.com http:// www.orgsyn.syn http:// www.merck.com http:// www.chemhelper.com http:// www.Lib.duke.edu/chem/infolist.htm	**websites**

8- Facilities required for teaching and learning

-Class room	**Data show, Computers, Internet**.
- Library	**Scientific books and journals**
Others	

9. Signature

Course Coordinator	Head of Department	Date
Prof. Dr. Fatma Elnabawyia goda	Prof Dr Shahenda Metwally ElMessery	9/2/2022

* Date of Dept. Council Approval

Dept. of Pharm. Org. Chem	Course Specification	Master Program

Master in Pharmaceutical Sciences (Pharmaceutical Organic Chemistry)

Course Specification

Academic year: 2021/2022

البرنامج	توصيف مقرر
Master in Pharmaceutical Sciences	Stereochemistry of Drugs

رئيس القسم	منسق المقرر
أ د. شاهنده متولي المسيري	To be nominated

General

University	Mansoura
Faculty	Pharmacy
Department offering the course	Pharmaceutical Organic Chemistry
Department supervising the course	Faculty of pharmacy
Program on which the course is given	Master in Pharmaceutical Sciences
Academic Level	Post-Graduate Level
Academic year	2021/2022 - Second semester- elective
Date of course specification approval	9/2/2022

A.Basic Information :Course data :

Course Title	Stereochemistry of Drugs
Course Code	POM-205
Prerequisite	------
Teaching Hours: Lecture	2
Total Credit Hours	2

B. Professional Information

1- Overall Aims of Course:

1.1 Recognizing the theory and background of chirality and provides an overview of the effects of enantiomers at biological receptors

1.2 Studying the use of chiral compounds as drugs, and the application of chirality as a tool in Synthetic Pharmaceutical Chemistry to obtain better potency, selectivity, and duration of action of drugs.

2- Intended Learning Outcomes (ILOs)

a. *Knowledge and Understanding*

After completion of the course, graduates will be able to

a1	Explain the theories and fundamentals of Stereochemistry
a2	Recognize the recent and advanced asymmetric methods of chiral drug synthesis
a3	Define the principles of the effects of chirality on the biological activity of drugs
a4	Understand the different between stereoisomers (enantiomers, diastereomers and conformers) of chiral compounds.

b. Intellectual Skills

After completion of the course, graduates will be able to

b1	Evaluate the methods of asymmetric/chiral Synthesis of drugs
b2	Interpret data of Chiral Resolution and its application in drug synthesis
b3	Examine the Effects of Chirality on potency, selectivity, and duration of action of drugs

c. Professional and Practical Skills

After completion of the course, graduates will be able to

c1	Prescribe the different synthetic routes for chiral drugs
c2	Relate the elements of symmetry, Stereochemistry and chemical Resolution to postulate a convenient synthetic scheme for drug synthesis

d. General and Transferable Skills

After completion of the course, graduates will be able to

d1	Practice self- assessment and learning needed for continuous professional development.
d2	Promote critical thinking, problem-solving and decision-making.
d3	Work effectively in a team and offer expertise and advice to others.
d4	Develop creativity and time management abilities.

3. Course Contents

Topics	Week	Hours
1. Introduction to Stereochemistry.	1-4	10
2. Chirality and chiral drug development.		
3. Elements of symmetry, Stereochemistry and chemical Resolution.		
4. Conformation, isosterism and anomeric carbons.		
5. Importance of chirality on bioactivity of pharmacologically active drugs.	5-8	6
6. Effects of Chirality on potency, selectivity, and duration of action of drugs.		

7. Stereochemistry and drug design		
8. Methods of Chiral Resolution and its application in drug synthesis.		
9. Asymmetric/Chiral Synthesis and its types.	**9-11**	**6**
10. Examples of synthetic routes for chiral drugs.		
	Total	**22 h**

4- Matrix of knowledge and skills of the course (contents versus ILOsof the course)

	Topics	Course ILOs			
		K.U*	**IS****	**P.P.S*****	**G.T.S******
1	Introduction to Stereochemistry.	a1, a3, a4	b1, b3	c1	d1, d2,d3, d4
2	Chirality and chiral drug development.	a1, a2, a3	b2, b3	c1	d1, d2,d3, d4
3	Elements of symmetry, Stereochemistry and chemical Resolution.	a1, a3	b2	c1	d1, d2,d3, d4
4	Conformation, isosterism and anomeric carbons.	a1, a2, a3, a4	b1, b2	c1	d1, d2,d3, d4
5	Importance of chirality on bioactivity of pharmacologically active drugs.	a1, a2, a3	b2	c1	d1, d2,d3, d4
6	Effects of Chirality on potency, selectivity, and duration of action of drugs.	a1, a2, a4	b1, b2	c1	d1, d2,d3, d4
7	Stereochemistry and drug design	a1, a2, a4	b1, b2	c1	d1, d2,d3, d4
8	Methods of Chiral Resolution and its application in drug synthesis.	a1	b2	c2	d1, d2,d3, d4

9	Asymmetric/Chiral Synthesis and its types.	a4	b1	c1, c2	d1, d2,d3, d4
10	Examples of synthetic routes for chiral drugs.	a2	b2	c2	d1, d2,d3, d4

** Knowledge and Understanding* ***Intellectual Skills***Professional and Practical Skills*
*****General and Transferable Skills*

5- Teaching and Learning Methods:

5.1	**Lecturesusing Power Point**(PPT) presentations
5.2	**Lectures using whiteboard**
5.3	**Video-recorded lectures**, uploaded to the University Portal for Online learning
5.4	Activities and **tasks required to develop students' self-learning skills**.
5.5	**Tutorial**, **Class Activity** and **Group Discussion** to explain what has not been understood
5.6	**Interactive Sessions** using Microsoft Teams

6- Student Assessment:

	Assessment Methods		**Assessment Schedule**	**Weighing of Assessments**
Assessment 1	**Written Exam (Final)**	Paper exams that are corrected electronically and/or manually. To assess understanding, intellectual, professional skills	weeks 14-15	90
Assessment 2	**Oral Exam**	To assess understanding, intellectual skills, General and Transferable skills	weeks 14-15	10
				100 %

7- List of References

	Reference	**Type**
1.	Organic Chemistry. Gonathan Clayden, Nick Greeves, Stuart Warren, and Peter Wothers (Editors). Oxford University Press Inc., New York (2001).	**Text Books**
2.	Chiral Separation Techniques: A Practical Approach, Second, completely revised and updated edition Edited by G. Subramanian Copyright © 2001 Wiley-VCH Verlag GmbH	**Text Books**
3.	Topics in Stereochemistry, Volume 19, Ernest L. Eliel and Samuel H. Wilen (Editors). JOHN WILEY & SONS (1989).	**Recommended Books**

4.	http:// www.pubmed.com http:// www.orgsyn.syn http:// www.merck.com http:// www.chemhelper.com http:// www.Lib.duke.edu/chem/infolist.htm	**websites**

8- Facilities required for teaching and learning

-Class room	**Data show, Computers, Internet.**
- Library	**Scientific books and journals**
Others	

9. Signature

Course Coordinator	Head of Department	Date
Prof. Dr. To be nominated	Prof Dr Shahenda Metwally ElMessery	9/2/2022

* Date of Dept. Council Approval

Dept. of Pharm. Org. Chem.	Course Specification	Master Program

Master in Pharmaceutical Sciences (Pharmaceutical Organic Chemistry)

Course Specification

Academic year: 2021/2022

البرنامج	توصيف مقرر
Master in Pharmaceutical Sciences	Heterocyclic Chemistry

رئيس القسم	منسق المقرر
أ د.شاهنده المسيري	ا.م.د. اماني صلاح مصطفي

General

University	Mansoura
Faculty	Pharmacy
Department offering the course	Faculty of pharmacy
Department supervising the course	Pharmaceutical Organic Chemistry
Program on which the course is given	Master in Pharmaceutical Sciences (Pharmaceutical Organic Chemistry)
Academic Level	Postgraduate
Academic year	2021/2022 - second semester
Date of course specification approval	9/2/2022

A.Basic Information :Course data :

Course Title	Heterocyclic Chemistry
Course Code	POM-202
Prerequisite	------
Teaching Hours: Lecture	2
Total Credit Hours	2

B. Professional Information

1- Overall Aims of Course:

1.1 Enable the student to understand the basic principles of organic chemistry concerning structures, nomenclature, preparation, properties of heterocycles.

1.2 Help the student to understand the basic principles of Functional group transformations.

1.3 Practice the students to perform practical synthesis of organic compounds (one step synthesis).

2- Intended Learning Outcomes (ILOs)

a- *Knowledge and Understanding*

After completion of the course, graduates will be able to

a1	Recall the basic Principles of basic, pharmaceutical, medical, social, behavioral, management, health and environmental sciences as well as pharmacy practice.

a2	Record the physico-chemical properties of various substances used in preparation of medicines and the properties of different pharmaceutical dosage forms including novel drug delivery systems.
a4	Use the Principles of isolation, synthesis, purification, identification, and standardization methods of pharmaceutical compounds and the principles of drug design, development and synthesis.

b- *Intellectual Skills*

After completion of the course, graduates will be able to

b2	Implement good laboratory practice and guidelines in pharmacy practice.
b5	Design appropriate methods of isolation, synthesis, purification, identification of various pharmaceutical compounds.
b9	Predict the physical properities and chemical reactivity of any organic compound on the basis of molecular structure. Use of some modern applications with the assistance of the computer in drug design.

c- *Professional and Practical Skills*

After completion of the course, graduates will be able to

c2	Determine the proper and safe dispersing of chemicals and pharmaceutical preparations
c3	Discover the appropriate methods for extraction, isolation, synthesis, purification, identification and/or standardization of active substances from different origins and for effective and safe dispensing, labeling, storing and distributing of medicines.
c5	Apply techniques used in operating pharmaceutical equipments and instruments

d- *General and Transferable Skills*

After completion of the course, graduates will be able to

d2	use numeric calculation and statistical methods as well as information technology tools
d3	Present information clearly in written, electronic and oral forms and communicate ideas and arguments effectively.
d4	Understand ethical, legal and safety guidelines.

3. Course Contents:

Topics	Week	Hours
1. Introduction to heterocyclic chemistry: Nomenclature, Classification, Reactivity	**1-2**	**4**
2. Five-membered Heterocycles (with 1 heteroatom)	**3**	**2**

3. Five-membered Heterocycles (with more than 1 heteroatom)	**4-5**	**4**
4. Drugs containing five-membered Heterocycles and its uses	**6-7**	**4**
5. Six-membered Heterocycles (with 1 heteroatom)	**8**	**2**
6. Six-membered Heterocycles (with more than 1 heteroatom)	**9-10**	**4**
7. Drugs containing six-membered Heterocycles and its uses	**11-**	**2**
	Total	**22 h**

4- Matrix of knowledge and skills of the course (contents versus ILOsof the course)

	Topics	**Course ILOs**			
1	Introduction to heterocyclic chemistry: Nomenclature, Classification, Reactivity	**K.U***	**IS****	**P.P.S*****	**G.T.S********
2	Five-membered Heterocycles (with 1 heteroatom)	a2	b5	c2	d2
3	Five-membered Heterocycles (with more than 1 heteroatom)	a1	b9	c3	d4
4	Drugs containing five-membered Heterocycles and its uses	a4	b2	c5	d3
5	Six-membered Heterocycles (with 1 heteroatom)	a2	b5	c2	d4
6	Six-membered Heterocycles (with more than 1 heteroatom)	a1	b2	c2	d3
7	Drugs containing six-membered Heterocycles and its uses	a4	b9	c5	d2,d3

* ***K**nowledge and **U**nderstanding*
** ***I**ntellectual **S**kills*
*** ***P**rofessional and **P**ractical **S**kills*
**** ***G**eneral and **T**ransferable **S**kills*

5- Teaching and Learning Methods:

5.1	**Lecturesusing Power Point**(PPT) presentations
5.2	**Lectures using whiteboard**
5.3	**Video-recorded lectures**, uploaded to the University Portal for Online learning
5.4	Activities and **tasks required to develop students' self-learning skills**.
5.5	**Tutorial**, **Class Activity** and **Group Discussion** to explain what has not been understood
5.6	**Interactive Sessions** using Microsoft Teams

6- Student Assessment:

	Assessment Methods		Assessment Schedule	Weighing of Assessments
Assessment 1	**Written Exam (Final)**	Paper exams that are corrected electronically and/or manually. To assess understanding, intellectual, professional skills	weeks 14-15	90
Assessment 2	**Oral Exam**	To assess understanding, intellectual skills, General and Transferable skills	weeks 14-15	10
				100 %

7- List of References

	Reference	Type
1.	Organic Chemistry by William H. Brown (Harcourt Brace College Publishers).	**Text Books**
2.	Introduction to Organic Chemistry, Solmons	**Text Books**
3.	Practical Skill in Chemistry. By John RDean, Alan M. Jones, David Holmes, Rob Reed, Jonathan Weyers and Allan Jones. Pearson Education	**Text Books**

8- Facilities required for teaching and learning

.

-Class room	**Data show, Computers, Internet.**
- Library	**Scientific books and journals**
Others	

9-Signature

Course Coordinator	Head of Department	Date
Assoc. Prof Amani Salah Moustafa	Prof Dr. ShahendaMetwally El-messery	9/2/2022

* Date of Dept. Council Approval: 9/2/2022

Dept. of Pharm. Org. Chem	Course Specification	Master Program

Master in Pharmaceutical Sciences (Pharmaceutical Organic Chemistry)

Course Specification

Academic year: 2021/2022

توصيف مقرر **النمذجة الجزيئية و تطوير الأدوية** **Molecular Modeling and Drug Development**	**البرنامج** **ماجستير الكيمياء العضوية الصيدلية**
منسق المقرر **ا.د. ماجده نصر احمد نصر**	**رئيس القسم** **أ د. شاهنده متولي المسيري**

General

University	Mansoura
Faculty	Pharmacy
Department offering the course	Pharmaceutical Organic Chemistry
Department supervising the course	----
Program on which the course is given	Master in Pharmaceutical Sciences
Academic Level	Postgraduate
Academic year	2021/2022- Second semester - elective
Date of course specification approval	9/2/2022

A. Basic Information :Course data :

Course Title	Molecular Modeling and Drug Development
Course Code	(POM-204)
Prerequisite	------
Teaching Hours: Lecture	2
Total Credit Hours	2

B. Professional Information

1- Overall Aims of Course:

1-1- Understanding the critical relationship among 3D structure and receptor function.
1-2- Utilizing basic modeling techniques to explore biological phenomena at the molecular level.
1-3- Emphasizing modelling drug/receptor interactions in detail by molecular mechanics, molecular dynamics simulations and homology modeling.
1-4- Recognizing the basic principles of Molecular modeling techniques and its application in modern drug discovery.
1-5- Studying rational drug design, three-dimensional structures and physicochemical properties of drugs and receptors.
1-6- Performing comprehensive modeling tasks such as Docking and QSAR methods.

2- Intended Learning Outcomes (ILOs)

a. *Knowledge and Understanding*

After completion of the course, graduates will be able to

a1	Explain the fundamentals of computational methods.
a2	Recognize different methods to locate. potential energy surfaces, local and global minima
a3	Define the molecular simulations and free energy calculations

a4	Explain Protein chemistry and to visualize larger datasets, to design a suitable drug and to predict biological activity.
a5	Describe different types of protein–ligand interactions and characterise binding pockets

b. Intellectual Skills

After completion of the course, graduates will be able to

b1	Use enzyme or receptor model to relate chemical structure to biological activity
b2	Differentiate between different groups of drugs.
b3	Predict the biological response of some drugs and medical use by referring to their chemical structures.
b4	Solve problems related to qualitative and quantitative information, extending to situations where evaluations have to be made on the basis of limited information.
b5	Examine the surface mapping of different proteins
b6	Conclude the main concepts of Drug Design and Development and their application in understanding drug actions

c. Professional and Practical Skills

After completion of the course, graduates will be able to

c1	Apply the given information to evaluate the activity of related compounds within a pharmacological class based on structural similarities and dissimilarities.
c2	Examine a drug structure to deduce relative receptor affinity, distribution potential, and potential side effects or toxicities based on functional group properties and structural similarity to other pharmacophores.
c3	Justify therapeutic recommendations based on an understanding of drug chemistry.
c4	Apply in practice setting the knowledge and understanding required to meet the needs of patients and other health care professional

d. General and Transferable Skills

After completion of the course, graduates will be able to

d1	Practice self- assessment and learning needed for continuous professional development.
d2	Develop presentation skills
d3	Manage time efficiently
d4	Work effectively in a team.
d5	Make appropriate decisions for arising problems

3. Course Contents

Topics	Week	Hours
1. Scope of Molecular modeling; overview on biomolecular modeling and simulation, from drug design to new materials	1-4	8
2. potential energy surfaces, local and global minima,		
3. Transition states determination and Geometry optimization		
4. Ab Initio calculation of protein structure by Global Optimization of Potential Energy.		
5. Introduction to interesting biomolecular modeling problems: protein folding	5-8	8
6-Stereo chemical aspects of drugs optical isomerism. Geometrical isomerism		
7. Receptor visualization, binding site determination		
8. Introduction to docking using different modules		
9. Molecular Modeling Applied to Drug Discovery, Pharmacophore modeling		
10. Computer aided drug design		
11. Structure Prediction - Introduction to Comparative Modeling. Sequence , homology modeling		
12- Principles of Structure based De Novo Ligand design, Drug Discovery –QSAR.	9-11	6
	Total	22 h

4-Matrix of knowledge and skills of the course (contents versus ILOsof the course)

Week	Topics	Course ILOs			
		K.U*	IS**	P.P.S***	G.T.S****
1	Scope of Molecular modeling; overview on biomolecularn modeling and simulation, from	a1, a3, a4, a5	b1, b3, b6	C1	d1, d2,d3,

	drug design to new materials				d4
2	potential energy surfaces, local and global minima,	a1, a2, a3	b2, b3	c1	d1, d2,d3, d4, d5
3	Transition states determination and Geometry optimization	a1, a3, a2	b4, b6	c1	d1, d2,d3, d4, d5
4	Ab Initio Calculation of Protein Structure by Global Optimization of Potential Energy.	a1, a2, a3, a4	b1, b2, b5	c1, c3	d1, d2,d3, d4 d5
5	Introduction to interesting biomolecular modeling problems: protein folding	a1, a2, a3	b2, b5, b6	c1	d1, d2,d3, d4 d5
6	Stereo chemical aspects of drugs optical isomerism. Geometrical isomerism	a1, a2, a4, a5	b1, b2, b5	c1, c2	d1, d2,d3, d4 d5
7	Receptor visualization, binding site determination	a1, a2, a4	b1, b2, b4	c1	d1, d2,d3, d4 d5
8	Introduction to docking using different modules	a1	b2, b3, b5	c2	d1, d2,d3, d4 d5
9	Molecular Modeling Applied to Drug Discovery , Pharmacophore modeling	a4, a5	b1, b6	c1, c2	d1, d2,d3, d4 d5
10	Computer aided drug design	a2, a5	b2, b4	c2, c4	d1, d2,d3, d4 d5
11	Structure Prediction - Introduction to Comparative, Modeling. Sequence , homology modeling	a1, a2, a3, a4	b1, b2, b3	c1, c2, c4	d1, d2,d3, d4 d5

** Knowledge and Understanding* ***Intellectual Skills***Professional and Practical Skills*
*****General and Transferable Skills*

5- Teaching and Learning Methods:

5.1	Lectures using Data Show and Power point presentation
5.2	Lectures using white board and computer software
5.3	Computers with specific softwares
5.4	Group discussion. Data analysis
5.5	Problem solving
5.6	Self-learning by discussion of projects prepared by students

5.7	Office hours
5.8	Assignments and Demonstrations

6- Student Assessment:

	Assessment Methods		Assessment Schedule	Weighing of Assessments
Assessment 1	**Written Exam (Final)**	Paper exams that are corrected electronically and/or manually. To assess understanding, intellectual, professional skills	weeks 14-15	90
Assessment 2	**Oral Exam**	To assess understanding, intellectual skills, General and Transferable skills	weeks 14-15	10
				100 %

7- List of References

	Reference	Type
1.	F. Jensen, Introduction to Computational Chemistry, (Wiley, New York, 1999). Good introductory textbook covering a variety of topics.	**Essential Book (Text Books)**
2.	A. Szabo and N. S. Ostlund, Modern Quantum Chemistry, Introduction to Advanced Electronic Structure Theory, 1st ed., revised (Dover, 1989). More mathematical detail for many of the ab initio electronic structure methods.	**Essential Book (Text Books)**
3.	Molecular Modelling: Principles and Applications (2nd Edition) 2nd Edition**.** **Andrew R. Leach** Oxford University Press Inc., New York (2001).	**Recommended Books**
4.	Guidebook on Molecular Modeling in Drug Design*Edited by:N. Claude Cohen* ISBN: 978-0-12-178245-0	**Recommended Books**
5.	http:// www.pubmed.com http:// http://www.sciencedirect.com/science/book/9780121782450 https://www.amazon.com/Guidebook-Molecular-Modeling-Drug-Design/dp/012178245X	**Web Sites**

8- Facilities required for teaching and learning

-Class room	**Data show, Computers, Internet.**
- Library	**Scientific books and journals**
Others	

9. Signature

Course Coordinator	Head of Department	Date
Prof Dr Magda Nasr Ahmed Nasr	Prof Dr. ShahendaMetwally El-messery	9/2/2022

* Date of Dept. Council Approval

Dept. of Pharm. Organic. Chem.	Course Specification	Master Program

Master in Pharmaceutical Sciences (Pharmaceutical Organic Chemistry)

Course Specification

Academic year: 2021/2022

البرنامج	توصيف مقرر
Master in Pharmaceutical Sciences	Structural Elucidation of Drugs

رئيس القسم	منسق المقرر
أ د. شاهنده متولي المسيرى	ا.د. محمد عادل مسعود

General

University	Mansoura
Faculty	Pharmacy
Department offering the course	Pharmaceutical Organic Chemistry
Department supervising the course	----
Program on which the course is given	Master in Pharmaceutical Sciences
Academic Level	Postgraduate
Academic year	2021/2022- Second semester
Date of course specification approval	9/2/2022

A. Basic Information : Course data :

Course Title	**Structural Elucidation of Drugs**
Course Code	**POM-203**
Prerequisite	------
Teaching Hours: Lecture	2
Practical:	-
Total Credit Hours	2

B. Professional Information

Overall Aims of Course:

1.1 Recognizing the interpretation steps to confirm the structure of the chemical compounds and the target products from the beginning to the final synthetic schemes.

1.2 Studying the theory and application of the spectroscopic methods in order to elucidate the skeletal structures of the designed and synthesized drugs.

2- Intended Learning Outcomes (ILOs)

a. *Knowledge and Understanding*

After completion of the course, graduates will be able to

a1	Explain the theories and fundamentals of spectroscopic methods.
a2	Recognize the recent and advanced scientific methods of interpretation of charts to confirm the structure of the chemical compounds.
a3	Define the principles of structural drug elucidation.

a4	Explain different methods used to differentiate between diastereomers and conformers of chiral drug.

b. Intellectual Skills

After completion of the course, graduates will be able to

b1	Analyze and evaluate the information in the spectra of 1D and 2D NMR
b2	Translate and interpret data from different spectroscopic charts (IR, C13 NMR & Mass spectrometry, X-ray).
b3	Examine the elemental analysis and the index of hydrogen deficiency to predict the molecular weight and formula of a compound.

c. Professional and Practical Skills

After completion of the course, graduates will be able to

c1	Prescribe the different types of functional groups and protons in a given IR and NMR Spectra, respectively.
c2	Relate the molecular weight and fragmentation pattern of a given compound to its structure through its mass spectrum.

d. General and Transferable Skills

After completion of the course, graduates will be able to

d1	Practice self- assessment and learning needed for continuous professional development.
d2	Promote critical thinking, problem-solving and decision-making.
d3	Work effectively in a team and offer expertise and advice to others.
d4	Develop creativity and time management abilities

3. Course Contents

Topics	Week	Hours
1. Introduction to Spectroscopic analysis and UV & CD spectroscopy	**1-5**	**10**
2. Determination of molecular formula and index of hydrogen deficiency		
3. Infrared spectroscopy and identification of functional groups		

4. Nuclear magnetic resonance HNMR		
5. Nuclear magnetic resonance C13NMR	**6-8**	**6**
6. Homotopic, enantiotopic, and diastereotopic protons		
7. The Nuclear Overhauser effect and 2 D NMR and its application		
8. X-ray crystallography and ESR (EPR) Spectroscopy	**9-11**	**6**
9. Determination of stereochemistry by spectroscopic methods		
10. Mass spectrometry and Molecular weight determination		
11. Determining organic structures using different spectra of spectroscopy tools		
	Total	**22 h**

4- Matrix of knowledge and skills of the course (contents versus ILOs of the course)

	Topics	**Course ILOs**			
		K.U*	**IS****	**P.P.S*****	**G.T.S******
1	Introduction to Spectroscopic analysis	a1, a3, a4	b1, b3	c1	d1, d2,d3, d4
2	Determination of molecular formula and index of hydrogen deficiency	a1, a2, a3	b2, b3	c1	d1, d2,d3, d4
3	Infrared spectroscopy and identification of functional groups	a1, a3	b2	c1	d1, d2,d3, d4
4	Nuclear magnetic resonance HNMR	a1, a2, a3, a4	b1, b2	c1	d1, d2,d3, d4
5	Nuclear magnetic resonance C^{13}NMR	a1, a2, a3	b2	c1	d1, d2,d3, d4
6	Homotopic, enantiotopic, and diastereotopic protons	a1, a2, a4	b1, b2	c1	d1, d2,d3, d4
7	The Nuclear Overhauser effect and 2 D NMR and its application	a1, a2, a4	b1, b2	c1	d1, d2,d3, d4
8	X-ray crystallography	a1	b2	c2	d1, d2,d3, d4

9	Determination of stereochemistry by spectroscopic methods	a4	b1	c1, c2	d1, d2,d3, d4
10	Mass spectrometry and Molecular weight determination	a2	b2	c2	d1, d2,d3, d4
11	Determining organic structures using different spectra of spectroscopy tools	a1, a2, a3, a4	b1, b2, b3	c1, c2	d1, d2,d3, d4

** Knowledge and Understanding* ***Intellectual Skills* ****Professional and Practical Skills*
*****General and Transferable Skills*

5- Teaching and Learning Methods:

5.1	**Lectures using Power Point** (PPT) presentations
5.2	**Lectures using whiteboard**
5.3	**Video-recorded lectures**, uploaded to the University Portal for Online learning
5.4	Activities and **tasks required to develop students' self-learning skills**.
5.5	**Tutorial**, **Class Activity** and **Group Discussion** to explain what has not been understood
5.6	**Interactive Sessions** using Microsoft Teams
5.7	Internet search and Research Assignments to design **Formative Assignments**
5.8	**Seminar / Workshop**

6- Student Assessment:

	Assessment Methods		**Assessment Schedule**	**Weighing of Assessments**
Assessment 1	**Written Exam (Final)**	Paper exams that are corrected electronically and/or manually. To assess understanding, intellectual, professional skills		90
Assessment 2	**Oral Exam**	To assess understanding, intellectual skills, General and Transferable skills		10
				100 %

7- List of References

Reference	Type
Introduction to Spectroscopy. Donald L. Pavia, Gary M. Lampman, George S. Kriz, James R. Vayvyan (Authors) 4th edition. Publisher: Brooks/Cole, Cengage Learning; (**2009**)	**Essential Books (Text Books)**
Organic Chemistry. Gonathan Clayden, Nick Greeves, Stuart Warren, and Peter Wothers (Editors). Oxford University Press Inc., New York (**2001**). Structure Determination of Organic Compounds: Tables of Spectral Data. E. Pretsch, P. Buhlmann, C. Affolter (Editors), Springer-Verlag Berlin Heidelberg (**2000**).	**Recommended Books**
http:// www.pubmed.com http:// www.orgsyn.syn http:// www.merck.com http:// www.chemhelper.com http:// www.Lib.duke.edu/chem/infolist.htm	**websites**

8- Facilities required for teaching and learning

-Class room	**Data show, Computers, Internet.**
- Library	**Scientific books and journals**
Others	

9. Signature

Course Coordinator	Head of Department	Date
Prof. Dr. Mohamed Adel Massoud	Prof Dr. **Shahenda M. El-Messery**	9/2/2022

* Date of Dept. Council Approval