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

Department of Medicinal Chemistry

ARS

Academic Year: 2021/2022

رئيس القسم

أ.د/ محمد أحمد أحمد مصطفى

M. Sc. in Pharmaceutical Sciences (Medicinal Chemistry)

Academic Reference Standards (ARS)

(Department Council Approval on 28/11/2021)

(Faculty Council Approval on / 5 / 2022)

Mansoura University
Faculty of Pharmacy
Quality Assurance Unit
Academic Reference Standards for
Postgraduate Programs

I. Attributes of the graduate:

The graduates of Master Degree of Pharmaceutical Sciences (Medicinal Chemistry) should capable of:

- **Applying the basics and methodologies of scientific research and manipulating its various tools in the field of medicinal chemistry.**
- **Mastering of advanced knowledge, professional research skills, attitudes and values in the field of medicinal chemistry and integrating with the relevant subjects in his/her professional practice.**
- **Recognizing the current issues in drug synthesis and/or analysis.**
- **Adopting the scientific thinking approaches in subjects relevant to drug development and/or drug analysis.**
- **Identifying and solving problems in the field of medicinal chemistry.**
- **Mastering adequate range of specialized professional skills and using appropriate technology to improve his/her professional practice.**
- **Communicating effectively and having ability to participate and lead team works.**
- **Taking appropriate professional and scientific decisions in light of the available information.**
- **Providing the ability to critically analyze the impact and outcomes of research results.**
- **Training in ethical and legal aspects of scientific research.**
- **Employing the available resources to achieve and preserve the maximum benefit.**
- **Exhibiting awareness of his/her role in the community development and preservation of environment in response to regional global changes.**
- **Reflecting commitment to integrity, credibility and rules of the pharmacy profession.**
- **Developing continuous self-academic and professional learning.**

II. 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 medicinal chemistry and other related fields.
1.2 . Recognize the recent and advanced scientific developments in the field of medicinal chemistry.
1.3 . Detect all basic and new techniques used in the field of drug design and/or drug quality control.
1.4 . Distinguished the value of ethics and legal issues of research and professional practice in medicinal chemistry.
1.5 Identify principles and fundamentals of quality in professional practice in the field of drug development and/or drug analysis.
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 medicinal 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 medicinal chemistry.
2.6 . Plan for development in pharmaceutical and medicinal chemistry.
2.7 . Generate profession 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 medicinal chemistry.
3.2 . Assess methods and techniques used in medicinal chemistry.
3.3 . Write and evaluate professional research reports in medicinal chemistry.

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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, continues learning and identify 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 Interoperate and evaluate data available from scientific research.
4.9 Show awareness of ethics and legal issues of research and professional practice in medicinal chemistry.

Reference:

National Academic Reference Standard (NARS) for postgraduate studies issued by NAQAAE 2009

Programed Coordinator: Head of Department

Head of Department: Pro. Dr. Mohamed Ahmed Moustafa

Program: Master in Pharmaceutical Sciences (Medicinal Chemistry)

Department of Medicinal Chemistry

Program Specification

Academic Year: *2021/2022*

رئيس القسم

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A-Basic Information

1	**Faculty**	**Pharmacy**
2	**Program Title:**	**Master in Pharmaceutical Sciences (Medicinal Chemistry)**
3	**Program Type:**	**multiple**
4	**Department (s):**	**Department of Medicinal Chemistry**
5	**Final award:**	**Master degree in Medicinal Chemistry**
6	**Coordinator:**	**Head of Department** **Prof. Dr / Mohamed Ahmed Moustafa**
7	**External Evaluator(s):**	**Prof. Dr / Magda Elsherbiny**
8	**Date of Program Specification Approval:**	***Department council: 28/11/2021,*** ***Faculty council: / 5 /*2022**

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 Medicinal chemistry.

1.1 Mastering of advanced knowledge, professional research skills, attitudes and values in the field of medicinal 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 medicinal chemistry.
1.3 Master practical research procedures according to the good laboratory practice (GLP) basics in Chemistry labs and perform experiments with safety guideline.
1.4 Mastering of all traditional and new techniques used in the field of drug synthesis and/or analysis.
1.5 Applying the scientific thinking approaches and problem based learning in subjects relevant to drug Development and/or drug analysis.
1.6 Formulating hypotheses based on current concepts in 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	Explain 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, pharmacokinetics, analysis and stability and the relevant subjects of medicinal Chemistry.
A3	Recognize the current problems, the recent and advanced scientific development of drug design, synthesis and/or drug quality control.
A4	Utilize effectively all basic and recent techniques and technological tools used in the field of drug synthesis and/or drug analysis.
A5	Identify the legal and ethical issues of research and professional practice in medicinal chemistry.
A6	Define the principles and the basics of quality in professional practice in the fields of medicinal 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 instrumental analysis, biostatistics, physical chemistry, bioinformatics and drug development.
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 medicina 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 analysis.
B6	Plan to improve performance and research in the field of medicinal 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.

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C- Professional and Practical Skills

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

C1	Apply different statistical methods for data analysis and validation.
C2	Development of different research methodologies and good experimental and reporting skills in the design, synthesis, analysis 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 drug analysis research.
C4	Outline and illustrate the calculations of the heat of the reaction, neutralization, combustion ...etc. of a chemical reaction.
C5	Carry out scientific research and contribute to the knowledge in the field of medicinal chemistry.
C6	Write accurately, evaluate professional reports and publish scientific research papers in scientific bran 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 medicinal 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: 28/11/2021,
Faculty Council Approval Date: / /

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,C5
	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

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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 represents 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
PDM-201	Drug Development	***General*** Compulsory	2	Spring
PDM-202	Drug Pharmacokinetics	***General*** Compulsory	2	spring
PDM-203	Structural Elucidation of drugs	***General*** Compulsory	2	Spring
PDM-204	Synthetic Chemistry of Drugs	elective	2	Spring
PDM-205	Drug Stability	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,A4	B1, B2	C2, C3	D1, D3, D5
Statistics and biostatistics (GCM-202)	2	A1	B1, B2, B7	C1	D1, D2, D3, D5
Physical chemistry (GCM-203)	1	A1	B1, B2	C4	D1, D3, D5
Bioinformatics (GCM-204)	1	A1	B1, B2, B4	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.)*					
Drug Development (PDM-201)	2	A2, A3	B1, B2, B3, B4, B9	C2, C6	D1, D2, D3, D4, D5
Drug Pharmacokinetics (PDM-202)	2	A2	B2, B3, B4, B9	C6	D1, D2, D3, D4, D5
Structural Elucidation Of drugs(PDM-203)	2	A2	B2, B3, B4, B7, B9	C2, C6	D1, D2, D3, D4, D5
Synthetic Chemistry of Drugs (PDM-204) (elective)	2(E)	A2, A3	B2, B3, B4, B5, B9	C2, C6	D1, D2, D3, D4, D5
Drug Stability (PDM-205) (elective)	2(E)	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*

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Code	Course title	K.U*							IS**								
		A1	A2	A3	A4	A5	A6	A7	B1	B2	B3	B4	B5	B6	B7	B8	B9
(PDM-201)	Drug Development		√	√					√	√	√	√					√
(PDM-202)	Drug Pharmacokinetics		√							√	√	√					√
(PDM-203)	Structural Elucidation of drugs		√							√	√	√			√		√
(PDM-204) (E)	Synthetic Chemistry of drugs		√	√						√	√	√	√				√
(PDM-205) (E)	Drug Stability		√	√						√	√	√					√

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

Code	Course title	P.P.S***								G.T.S****										
		C1	C2	C3	C4	C5	C6	C7	C8	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11
(PDM-201)	Drug Development		√				√			√	√	√	√	√						
(PDM-202)	Drug Pharmacokinetics						√			√	√	√	√	√						
(PDM-203)	Structural Elucidation of drugs		√				√			√	√	√	√	√						
(PDM-204) (E)	Synthetic Chemistry of drugs		√				√			√	√	√	√	√						
(PDM-205) (E)	Drug Stability		√				√			√	√	√	√	√						

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 Dept 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:

9.1- Computers.

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

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

9.4- Access to research engines for scientific periodicals in the field of *specialization*.

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: Head of Department
Head of Department: Prof. Dr. Mohamed Ahmed Moustafa

Signature:

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

Program: Master's in Pharmaceutical Sciences (*Medicinal Chemistry*)

Department of Medicinal Chemistry

Master's Thesis Specification

Academic Year: 2021/2022

رئيس القسم

أ.د/ محمد احمد احمد مصطفى

signature

A-Basic Information

1	**Faculty**	**Pharmacy**
2	**Program Title:**	**Master's in Pharmaceutical Sciences (***Medicinal Chemistry***)**
3	**Program Type:**	**Single**
4	**Department (s):**	**Medicinal Chemistry**
	Total credits of the Thesis	**42 C. H.**
	Total credits of the Program	**50 C. H.**
5	**Final award of the Program:**	**Master's degree of Pharmaceutical Sciences (***Medicinal Chemistry***)**
6	**Coordinator:**	**Head of Department** **Prof. Dr / Mohamed Ahmed Moustafa**
7	**External Evaluator(s):**	**Prof. Dr. Eman Rady El-Bendary**
8	**Date of Program Specification Approval:**	***Department council 28/11/2021,*** ***Faculty council: / 5 /2022***

B-Professional Information

1-Aims

The overall aims of the thesis:

1.1	Mastering of advanced knowledge, professional research skills and integrating with the relevant subjects in his/her professional practice.
1.2	Mastering of all traditional and new techniques used in the field of drug design and/or analysis.
1.3	Attaining communications skills, research ethics, time management, decision-making and team working.
1.4	Applying the scientific thinking approaches and problem-based learning in subjects of drug developments and/or analysis.

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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:

A2	a1	The basics and theories of drug development such as design, synthesis, structural elucidation, pharmacokinetics, and drug analysis.
A5	a2	The ethics and guidelines for the research and professional practice in medicinal chemistry
A7	a3	Recognition of a certain research problem and find the appropriate solution through collecting the required data.

b- Intellectual Skills

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

B1	b1	Processing the obtained data in the field of instrumental analysis and biostatistics.
B2	b2	Develop solutions for the scientific research problems based on logic and critical thinking.
B4	b3	Use the available scientific resources in order to tackle a certain research problem.
B9	b4	Provide a scientific discussion and communication based on the evidence and proof.

c- Professional and Practical Skills

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

C2	c1	Demonstrate reasonable experimental skills in design, synthesis, structure elucidation.
C5	c2	Carry out scientific research in the field of medicinal chemistry.
C6	c3	Evaluate professional reports, scientific writing and publishing in scientific journals and conferences.
C8	c4	Recognize the effect of the conducted work on the community.

d. General and Transferable Skills

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

D1	d1	Provide clear communication.
D2	d2	Operate computer software and maneuver online database to analyze research data.
D6	d3	Tackle problems and obstacles.
D5	d4	Encourage critical thinking and making decisions.
D7	d5	Acquire team-work expertise.
D11	d6	Develop presentation skills through seminars and thesis defense.

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	a3	-	c3, c4	d3, d4, d6
3	Objectives/Rational	a1, a3	b2, b3	-	d3
4	Results and Discussion	a1	b4	c3	d2
5	Experimental Work	a1, a2	b1	c1, c2	d2
6	Conclusion	-	-	c4	d5

* ***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

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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	Laboratory with non-toxic environment and required equipment.
Library	EKB
Others	Computers with molecular modelling software.

Thesis Coordinator	Head of Department	Date*
Head of Department	Prof. Dr. Mohamed Ahmed Moustafa	28 /11 / 2021

* Date of Dept. Council Approval

Dept. of Med. Chem.	Course Specification	M.Sc.

Program: Master in Pharmaceutical Sciences

Course Specification

Academic year: 2021/2022

البرنامج
ماجستيرالعلوم الصيدلية (الكيمياء الدوائية)

توصيف مقرر
تطوير الأدوية
Drug Development (PDM-201)

رئيس القسم

أ د. محمد أحمد أحمد مصطفى

منسق المقرر

ا.د. محمود بكر العشماوي

Master Program - Medicinal Chemistry
Drug Development Course (PDM-201)
(2021/2022)

Faculty :	Pharmacy
Department :	Medicinal Chemistry
Programme on which the course is given:	**Master in Pharmaceutical Sciences (Medicinal Chemistry)**
Major or minor element of programme:	Major
Department offering the programme:	Faculty
Department offering the course:	Medicinal Chemistry
Academic year / level:	Post-Graduate Level
Date of specification approval:	**6 / 12 /2021**

A- Basic information

Title (and Code):	**Drug development (PDM-201)**	
Lecture:	2 C.H./week	Total: 24 C.H.

B- Professional Information

1- Overall Aims of Course

1.1 Providing knowledge and understanding on the process of drug discovery and development.
1.2 Acquiring the necessary skills required to perform the different stages in drug development.

2 – Intended Learning Outcomes (ILOs)

Knowledge and Understanding

After completion of the course, graduates will be able to:

	a1	Describe the theories and fundamentals governing drug development processes
	a2	Identify the bench-to-market processes involved in drug development
	a3	Name the different techniques involved in drug design processes
	a4	Review the process of Regulation & Patenting new chemical entities

Intellectual Skills

After completion of the course, graduates will be able to:

	b1	Analyze and evaluate the information in the field of drug development
	b2	Justify the *preclinical and clinical* testing techniques to determine activity and/or toxicity
	b3	Create new ideas to tackle problems in chemical and process development

Professional and Practical Skills

After completion of the course, graduates will be able to:

	c1	Interpret a case history in the discovery and development of a new drug.
	c2	Validate the ethical issues involved in the drug development process.
	c3	Manipulate the different codes of practice in drug development process.

General and Transferable Skills

After completion of the course, graduates will be able to:

	d1	Practice self- assessment and learning principles needed for continuous professional development.

	d2	Promote critical thinking, problem-solving and decision-making abilities.

3- Course Contents:

week	Topics	Hr(s)
1	Introduction: the drug design and development processes.	**2**
2-5	Drug Design Strategies	**8**
6	Preclinical trials: Testing of Toxicity and safety, Drug metabolism, Pharmacology, Formulation and stability.	**2**
7	Clinical Trials: different phases and Ethical Issues	**2**
8	Patents & Regulatory Affairs	**2**
9	Chemical and Process Development	**2**
10	Code of Practice: GLP, GMP & GCP.	**2**
11,12	Oral Presentations and Reports	**4**
--	**Final written and oral exams**	**--**
		24 h

4- Matrix of knowledge and skills of the course

week	Topics	Course ILOs			
		K.U*	**IS****	**P.P.S*****	**G.T.S******
1	Introduction & Definitions.	a1, a2			
2-5	Drug Design Strategies	a3	b1	c1	d1, d2
6-7	Preclinical & Clinical Testing	a1, a2	b2	c2	d1, d2
8	Patents & Regulation	a4	b1		d1, d2
9-12	Chemical/Process Development Code of Practice & Presentation		b3	c3	d1, d2

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

5 – Learning Methods

5.1	Lectures presented by Power point on face-to-face meetings
5.2	Lectures presented as videos on the University Portal Online learning
5.3	Interactive Sessions using Microsoft Teams
5.4	Online Assignments to enhance students' self-learning.

6. Student assessments

	Assessment Methods		**Assessment Schedule**	**Weighing of Assessments**
1	Written Exam (Final)	Paper exams that are corrected manually. To assess understanding and intellectual skills	14th , 15th week	90 %
2	Oral Exam	To assess understanding, intellectual, professional and transferable skills	14th , 15th week	10 %
				100 %

7 - References

No.	Reference	Type
1	An Introduction to Medicinal Chemistry. 6th Edition, By Graham L. Patrick (Author) Publisher: Oxford University Press, Oxford; 2017 ISBN-13: 978-0198749691. ISBN-10: 9780198749691	Essential Book
3	Drug Discovery and Development. 2nd edition. Technology in Transition. R. Hill (editor). Churchill Livingstone, Elsevier, Edinburgh. **2012** Paperback ISBN: 9780702042997 eBook ISBN: 9780702053160 Number at Library 213/3	Book
3	The Process of New Drug Discovery and Development. Second Edition. C.S. Smith and S.T. Donnell. (Editors) CRC Press. **2006**. ISBN 9780849327797 - CAT# 2779. Number at Library 200/3	Book
4	http:// www.fda.gov http:// www.drugs.com	Web Sites
5		Periodicals,

8 – Facilities Required

- Laptop computers

Course Coordinator	Head of Department	Date*
Prof. Dr. Mahmoud Bakr	**Prof Dr. Mohamed A. A. Moustafa**	**6 / 12 / 2021**

* Date of Dept. Council Approval

Dept. of Med. Chem.	Course Specification	M. Sc.

Program: Master in Pharmaceutical Sciences

Course Specification

Academic year: 2021/2022

البرنامج	توصيف مقرر
دكتوراه	Sample Preparation

رئيس القسم	منسق المقرر
أ د. محمد أحمد مصطفى	د. نورة حمدان

General

University	Mansoura
Faculty	Pharmacy
Department offering the course	Medicinal Chemistry
Department supervising the course	Medicinal Chemistry
Program on which the course is given	M. Sc. program
Academic Level	Postgraduate
Academic year	2021/2022 - second semester
Date of course specification approval	Department council: 6/12/2021 Faculty council: /5/2022

A.Basic Information: Course data:

Course Title	Drug Stability
Course Code	PDM-205 (E)
Prerequisite	------
Teaching Hours: Lecture	2 عدد الساعات الزمنية
Total Credit Hours	2

B. Professional Information

1- Overall Aims of Course:

1. Acquiring advanced knowledge in the field of drug stability.
2. Showing considerable awareness regarding the current problems and the recent theories and trends in the field of drug stability.
3. Attaining communication skills, research ethics, time management, decision-making, and team-working.

2- Intended Learning Outcomes (ILOs)

2.a. *Knowledge and Understanding*

After completion of the course, graduates will be able to

A2	a1	Explain the theories and fundamentals of drug stability.
A3	a2	Recognize the current problems, the recent and advanced scientific development of drug quality control.

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2.b. Intellectual Skills

After completion of the course, graduates will be able to

B2	b1	Demonstrate logic and critical way of thinking to suggest solutions for scientific and professional problems according to accompanying circumstances and causes.
B3	b2	Demonstrate creativity and innovative scientific and professional approaches regarding medicinal chemistry.
B4	b3	Utilize the available professional and scientific resources and research skills to solve problems.
B9	b4	Participate in comprehensive scientific and professional discussions and communications based on scientific evidences and proofs.

2.c. Professional and Practical Skills

After completion of the course, graduates will be able to

C2	c1	Development of different research methodologies and good experimental and reporting skills in the design, synthesis, analysis and elucidation of structure of pharmaceutically-relevant organic compounds.
C6	c6	Write accurately, evaluate professional reports and publish scientific research papers in scientific bran journals and conferences.

2.4. General and Transferable Skills

After completion of the course, graduates will be able to

D1	d1	Communicate clearly by verbal and written means.
D2	d2	Manipulate computer program, online database, software and other IT to get information and analyze the obtained research data.
D3	d3	Practice self- assessment and learning needed for continuous professional development.
D4	d4	Utilize different available information resources relevant to medicinal chemistry.
D5	d5	Promote critical thinking, problem-solving and decision-making capabilities.

3. Course Contents

Week No	Topics	No. of hours	Lecture (hr.)
1.	• Introduction of drug stability	2	2 hrs
2.	• Factors affecting drug stability	2	2 hrs
3.	• Types of drug degradation	2	2 hrs
4.	• Types of stability studies	2	2 hrs
5.	• Methods of accelerated stability testing in dosage forms	2	2 hrs
6.	• Temperature and humidity control	2	2 hrs
7.	• Importance and need of stability testing	2	2 hrs
8.	• Degradation pathways	2	2 hrs
9.	• Kinetic stability	2	
10.	• Solution stability	2	2 hrs
11.	• Solid state stability	2	2 hrs
12.	• pH stability profile	2	2 hrs
13.	**Final written & oral exam**		

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

No	Course contents	Study Week	ILOS			
			Knowledge & understanding	Intellectual skills	Professional and practical skills	General & transferable skills
1	• Introduction of drug stability • Factors affecting drug stability	1-2	A2, A3	B2, B3, B9	C2, C6	D1, D2,
2	• Types of drug degradation • Types of stability studies	3-4	A2	B3, B4	C2, C6	D3, D4,
3	• Methods of accelerated stability testing in dosage forms. • Temperature and humidity control • Importance and need of stability testing. • Degradation pathways • Kinetic stability	5-9	A2, A3	B2, B9	C2, C6	D2, D3, D5
4	• Solution stability • Solid state stability • pH stability profile	10-12	A2, A3	B2, B3, B4, B9	C2, C6	D1, D2, D3

5- Teaching and Learning Methods:

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

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
1.	**Drug stability principles and practices "informa healthcare", 3rd Edition, By Cartensen J., Marcel D. (Author), Volume 107; 1990.**	Essential Book **(Text Books)**
2.	**"Drug Stability for Pharmaceutical Scientists" By Thorsteinn Loftsson (Author); 2014.**	Essential Book **(Text Books)**
3.	**http:// www.ekb.eg** **http://www.drugs.com**	websites

8- Facilities required for teaching and learning

-Class room	**Data show- Computers, Internet.**
- Laboratory facilities	**Equipment, tools**
- Library	**Text Books**
Online learning	**Microsoft Teams**

9. Signature

Course Coordinator	Head of Department	Date*
Dr. Noura Hemdan	Prof Dr. Mohamed A. A. Moustafa	6/12/2021

* Date of Dept. Council Approval

Dept. of Med. Chem.	Course Specification	M.Sc.

Program: Master in Pharmaceutical Sciences

Course Specification

Academic year: 2021/2022

توصيف مقرر
حركيه الدواء
Drug Pharmacokinetics

البرنامج
ماجستير

منسق المقرر
ا.د. محمد احمد مصطفى

رئيس القسم
أ د. محمد أحمد مصطفى

General

University	Mansoura
Faculty	Pharmacy
Department offering the course	Medicinal Chemistry
Department supervising the course	Medicinal Chemistry
Program on which the course is given	M. Sc. program
Academic Level	Postgraduate
Academic year	2021/2022 - second semester
Coordinator:	Prof.Dr/ Mohamed A. Moustafa
External Evaluator(s):	Prof.Dr/ Eman El-Bendary
Date of course specification approval	Department council: 6/12/2021 Faculty council: 5/2022

A. Basic Information :Course data :

Course Title	Drug Pharmacokinetics
Course Code	PDM-202
Prerequisite	------
Teaching Hours: Lecture	2 عدد الساعات الزمنية
Total Credit Hours	٢

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 *Medicinal Chemistry*

1.1 Acquiring advanced knowledge in the field of drug pharmacokinetics.
1.2 Studying the concepts of drug absorption, distribution, biotransformation and execretion and their optimization to increase drug discovery success.
1.3 Relating specialized knowledge in the field of drug pharmacokinetics and its integration with the relevant subjects in his/her professional practice

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2-Intended Learning Outcomes (ILOs)

a- Knowledge and Understanding:

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

a1	Explain the theories and fundamentals of drug pharmacokinetic.
a2	Recognize the relationship between drug-likeproperties and bioavailability.
a3	Define the structure modification strategies, to guide property optimization.
a4	Explain basic concepts in drug metabolism and its impacts on drug bioavailability.

b- Intellectual Skills

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

b1	Analyze and evaluate the information in the field of drug pharmacokinetics.
b2	Interpret the structural features of a given drug in relation to its drug-like properties.
b3	Demonstrate logic and critical way of thinking to suggest solutions for scientific and professional problems according to accompanying circumstances and causes.
b4	Utilize metabolic concepts to control drug properties and drug interactions.

c- Professionaland Practical Skills

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

c1	Prescribe structure-property relationship (SPR) case studies, to see how structure affects proprties.
c2	Specify the structural features that affect pharmacokinetic and pharmacological properties of a drug.
c3	Justify therapeutic recommendations based on understanding of drug chemistry and pharmacokinetics characters.
C4	Integrate drug properties into drug discovery research.

d. General and Transferable Skills

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

d1	Practice self-learning needed for continuous professional development.
d2	Utilize different available information resources relevant to medicinal chemistry.
d3	Promote critical thinking, problem-solving and decision-making capabilities.
d4	Work effectively in a team and offer expertise and advice to others.
d5	Evaluate and criticize scientific work, literature and research data.

3-Academic Reference Standards(ARS):

Approved by both the department and faculty councils
Department Council Approval Date: 6/12/2021,
Faculty Council Approval Date:

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, a3
	1.2	a3, a4
	1.1	a1, a2, a3
2. **Intellectual Skills**	**2.1**	b1
	2.2	b2, b3, b4
	2.3	b5, b7
	2.4	b6, b8
3. **Professionaland Practical Skills**	**3.1**	c1,c2, c3
	3.2	c4, c5, c6
	3.3	c7
4. **General and Transferable Skills**	**4.1**	d1
	4.2	d2
	4.3	d3

4-Curriculum Structure and Contents

4.1 The candidate gains his master degree after 46 credit hours of study (16 credit hours of courses and 30 credit hours for thesis).

4.2 The candidate should study at least 16 credit hours of graduate courses. The courses will possess the code [200]. 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.

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4.3 The candidateshould perform research thesis (30 credit hours) in a subject assigned by the supervision committee, endorsed by the department council, the committee of graduate studies & research and the faculty council.

4.4 The candidate should publish at least one scientific research paper in scientific journals before the approval of a committee of discussion and judgment.

	Weeks	Topic	Hours
Drug Pharmacokinetics	**1-12**	Introduction to drug pharmacokinetics.	**2**
		Rules for drug-like properties. Lipophilicity, pKa and pharmacokinetic parameters. Pharmacokinetics and clearance.	
		Solubility and permeability. Permeability and permeability structure modification strategies.	**2**
		Transporters and blood brain barrier.	**2**
		Metabolic stability and plasma protein binding.	**2**
		Metabolic stability and its employment in drug design.	**2**
		Structural modification strategies to improve solution stability.	**2**
		Drug design based on metabolic considerations Toxicity mechanisms.	**12**
		Total	**24 h**

5- Program Courses

1- Achievement of Program Intended Learning Outcomesvia the courses

Course	C.H/ week	Program ILOs (by No.)			
		K.U*	IS**	P.P.S***	G.T.S****
First Semester -*General Courses (8C.H.)*					
Instrumental Analysis (GCM-201)	**2**	a1			
Statistics and biostatistics (GCM-202)	**2**	a1			
Physical chemistry (GCM-203)	**1**	a1			
Bioinformatics (GCM-204)	**1**	a1			
Research Methodology & Ethics (GCM-205)	**1**	a5			
Scientific writing and Seminar (GCM-206)	**1**	a7			

Total	**8**				
Second Semester- *Special Courses (8 C.H.)*					
PDM-201	**2**	a1, a2, a3, a4	b1, b2, b3	c1, c2, c3	d1, d2
PDM-202	**2**	a1, a2, a3, a4	b1, b2, b3, b4	c1, c2,c3,c4	d1, d2, d3, d4
PDM-203	**2**	a1, a2, a3	b1, b2, b3	c1, c2, c3, c4	d1, d2, d3, d4
PDM-204 (E)	**2(E)**	a1, a2, a3	b1, b2, b3	c1, c2, c3	d1, d2, d3, d4
Total	**8**				
Thesis	**30**				
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*

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Code	Course title	K.U*				IS**				P.P.S***				G.T.S****			
		a1	a2	a3	a4	b1	b2	b3	b4	c1	c2	c3	c4	d1	d2	d3	d4
PDM-201	Drug Development	√	√	√	√	√	√	√		√	√	√		√	√		
PDM-202	Drug Pharmacokinetics	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√
PDM-203	Structure Elucidation of Drugs	√	√	√		√	√	√				√	√	√	√	√	√
PDM-204	Synthetic Chemistry of Drugs (E)	√	√	√		√	√	√		√	√	√		√	√	√	√

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

6- Student Assessment Methods

6.1- Written exam (special courses).

6.2- Oral exam (special courses).

6.2- Published scientific research paper.

6.3- Public presentation and discussion of the Thesis.

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 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:

9.1- Computers.

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

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

9.4- Access to research engines for scientific periodicals in the field of Drug Pharmacokinetics

10-Thesis

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

Program Coordinator: Prof. Dr. Mohammed Ahmed Moustafa

Head of Department:Prof. Dr. Mohammed Ahmed Moustafa
Signature:

Annex 1
Attach courses and thesis specifications.

Dept. of Med. Chem.	Course Specification	M.Sc.

Program: Master in Pharmaceutical Sciences

Course Specification

Academic year: 2021/2022

البرنامج
ماجستيرالعلوم الصيدلية (الكيمياء الدوائية)

توصيف مقرر
إثبات التركيب البنائي للأدوية
Structure Elucidation of Drugs

رئيس القسم

أ د. محمد أحمد أحمد مصطفى

منسق المقرر

ا.د. نادية صبري الجوهري

General

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

A. Basic Information: Course data:

Course Title	Structure Elucidation of Drugs
Course Code	PDM-203
Prerequisite	------
Teaching Hours: Lecture	2 h/week
Total Credit Hours	24 h

B. Professional Information

1- Overall Aims of Course:

1.1. Upgrading the knowledge of spectroscopic methods and techniques used for identification, elucidation and analyses of pharmaceutical compounds.

1.2. Developing the ability of the students to interpret spectra with the study of the principles and advanced techniques of Mass Spectroscopy (MS), Infrared (IR), Nuclear Magnetic Resonance [NMR (^{1}H and ^{13}C, 2D (^{1}H-^{1}H COSY&HETCOR spectrum, ESR, MRI, saturation transfer, collective spectroscopic problems)], and their application in the identification and characterization of organic compounds.

1.3. Practicing problems that involve interpretation of IR, MS and NMR spectra of selected medicinal organic compounds.

2- Intended Learning Outcomes (ILOs)

2.1. *Knowledge and Understanding*

After completion of the course, graduates will be able to

a1	Identify and recognize various chemical structure representations of aliphatic, aromatic and heterocyclic compounds as well as pharmacophoric moieties by using spectroscopic analysis.
a2	Describe the basic principles of IR, ^{1}H & ^{13}C NMR and mass spectroscopy.

a3	Match the different terms related to ^{1}H NMR, including chemical equivalence, chemical shift and nuclear magnetic moments and basis of mass spectroscopy and infrared absorption process.

2.2. Intellectual Skills

After completion of the course, graduates will be able to

b1	Translate and interpret data from different spectroscopic charts (IR, NMR & Mass spectra).
b2	Apply different data like molecular formula, molecular weight, infrared, NMR, mass spectrum to finally discover the structure of a given compound
b3	Taking scientific decisions based on the spectral data.

2.3. Professional and Practical Skills

After completion of the course, graduates will be able to

c1	Categorize different types of functional groups in a given IR Spectrum.
c2	Integrate the different types of proton or carbons in a given ^{1}H NMR and ^{13}C NMR spectrum.
c3	Specify the molecular weight and fragmentation pattern of a given compound and design its structure through its mass spectrum data.
c4	Integrate the different spectroscopic data of organic compound to specify and design the final chemical structure

2.4. General and Transferable Skills

After completion of the course, graduates will be able to

d1	Promote critical thinking, problem-solving and decision-making capabilities.
d2	Utilize information in this course for the solution of some problems.
d3	Work effectively in a team and offer expertise and advice to others.
d4	Evaluate and criticize scientific work, literature and research data.
d5	Practice self-learning needed for continuous professional development.

3. Course Contents

Weeks	Topics	Lecture Hours
1-8	NMR spectroscopy [^{1}H and ^{13}C, 2D (1H1H COSY&HETCOR spectrum, ESR, MRI, saturation transfer, Collective spectroscopic problems)]	**16**
9-10	IR spectroscopy	**4**
11-12	The mass spectrometry and exact mass determinations	**4**
Total: 12 weeks		**24**

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Master Program
Structure Elucidation of Drugs Course
Specification

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

Week	Topic	Course ILOs			
		K.U*	IS**	P.P.S***	G.T.S****
1-8	NMR spectroscopy [^{1}H and ^{13}C, 2D (^{1}H-^{1}H COSY&HETCOR spectrum, ESR, MRI, saturation transfer, Collective spectroscopic problems)]	a1,a2,a3	b1,b2,b3	c2,c4	d1,d2,d3, d4,d5
9-10	IR spectroscopy	a1,a2	b1,b2,b3	c1,c4	d1,d2,d3, d4,d5
11-12	The mass spectrometry and exact mass determinations	a1,a2	b1,b2,b3	c3,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 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**

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	13th week	90 Marks (90%)
Assessment 2	**Oral Exam**	To assess understanding, intellectual skills, General and Transferable skills	13th week	10 Marks (10%)
				100 %

7- List of References

	Reference	Type
1.	Spectrometric identification of organic compounds (7th Edition) R. M. SILVERSTEIN, G. C. BASSLER AND T. C. MORRILL. Wiley, New York, 2005.	Text Books
2.	2.1. Basic One- and Two-Dimensional NMR Spectroscopy 5th Edition by Horst Friebolin, Wiley-VCH; (2010) 2.2. Understanding NMR Spectroscopy, 2nd Edition by James Keeler, John Wiley and Sons, Inc.; (2010)	Text Books
3.	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**	**Books**

9. Signature

Course Coordinator	Head of Department	Date
Prof. Dr. Nadia S. El-Gohary	**Prof. Dr.** Mohamed A. A. Moustafa	12/2021

* Date of Dept. Council Approval

Dept. of Med. Chem.	Course Specification	M.Sc.

Program: Master in Pharmaceutical Sciences

Course Specification

Academic year: 2021/2022

توصيف مقرر
التشيد الكيميائى للادويه
Synthetic Chemistry of Drugs

البرنامج
ماجستير

منسق المقرر
ا.د. محمد الكرداوى

رئيس القسم
أ د. محمد أحمد أحمد مصطفى

General

University	Mansoura
Faculty	Pharmacy
Department offering the course	Medicinal Chemistry
Department supervising the course	Medicinal Chemistry
Program on which the course is given	M. Sc. program
Academic Level	Postgraduate
Academic year	2020/2021 - second semester
Coordinator:	Prof.Dr/ Mohammed M. El-Kerdawy
External Evaluator(s):	Prof.Dr/ Eman El-Bendary
Date of course specification approval	Department council: 6/12/2021

A. Basic Information :Course data :

Course Title	Synthetic Chemistry of Drugs
Course Code	PDM-202
Prerequisite	------
Teaching Hours: Lecture	2 عدد الساعات الزمنية
Total Credit Hours	2

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 Synthetic Chemistry of Drugs.

1.1 Mastering of advanced knowledge, professional research skills, attitudes and values in the field of medicinal chemistry.
1.2 Mastering the basics and methodologies of synthetic chemistry and manipulating its various tools in the field of drug synthesis.
1.3 Mastering of all traditional and new techniques and methods used in the field of drug synthesis
1.4 Formulating hypotheses based on current concepts in medicinal chemistry field.

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2-Intended Learning Outcomes (ILOs)

a- Knowledge and Understanding:

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

a1	Explain the theories and fundamentals of synthetic chemistry in drug synthesis.
a2	Recognize the current problems, the recent and advanced development of drug synthesis.
a3	Utilize effectively all basic and recent techniques and technological tools used in drug synthesis.

b- Intellectual Skills

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

b1	Demonstrate logic and critical way of thinking to suggest solutions for scientific and professional problems according to accompanying circumstances and causes.
b2	Assess professional and scientific risks in practicing drug synthesis.
b3	Utilize the available professional and scientific resources and research skills to solve problems.

c- Professionaland Practical Skills

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

c1	Develop different research methodologies and good experimental and reporting skills in the design, synthesis of drugs.
c2	Manage safely and efficiently advanced technological research tools and equipments relevant to drug synthesis.
c3	Develop scientific research and contribute to the knowledge in the field of drug development and synthesis.

d. General and Transferable Skills

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

d1	Practice self-learning needed for continuous professional development.
d2	Utilize different available information resources relevant to medicinal chemistry.
d3	Promote critical thinking, problem-solving and decision-making capabilities.
d4	Work effectively in a team and offer expertise and advice to others.
d5	Evaluate and criticize scientific work, literature and research data.

3-Academic Reference Standards(ARS):

Approved by both the department and faculty councils
Department Council Approval Date: 8/12/2021,
Faculty Council Approval Date:

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, a3
	1.2	a3, a4
	1.1	a1, a2, a3
2. **Intellectual Skills**	**2.1**	b1
	2.2	b2, b3, b4
	2.3	b5, b7
	2.4	b6, b8
3. **Professionaland Practical Skills**	**3.1**	c1,c2, c3
	3.2	c4, c5, c6
	3.3	c7
4. **General and Transferable Skills**	**4.1**	d1
	4.2	d2
	4.3	d3

4-Curriculum Structure and Contents

4.1 The candidate gains his master degree after 46 credit hours of study (16 credit hours of courses and 30 credit hours for thesis).

4.2 The candidate should study at least 16 credit hours of graduate courses. The courses will possess the code [200]. 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.

4.3 The candidate should perform research thesis (30 credit hours) in a subject assigned by the supervision committee, endorsed by the department council, the committee of graduate studies & research and the faculty council.

4.4 The candidate should publish at least one scientific research paper in scientific journals before the approval of a committee of discussion and judgment.

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	Weeks	Topic	Hours
Synthetic Chemistry of Drugs	1-12	The Role of Synthetic Chemistry in Drug Discovery	2
		Developing Simple, Effective, Efficient Work-ups and Isolations	
		Aromatase Inhibitors for breast Cancer	2
		Quinolone Antibiotics	2
		Triazole Antifungals	2
		ACE Inhibitors for Hypertension	2
		Calcium Channel Blockers	2
		Named Organic Reactions	12
		Total	**24 h**

5- Program Courses

1- Achievement of Program Intended Learning Outcomesvia the courses

Course	C.H/ week	Program ILOs (by No.)			
		K.U*	IS**	P.P.S***	G.T.S****
First Semester -*General Courses (8C.H.)*					
Instrumental Analysis (GCM-201)	2	a1			
***Statistics and biostatistics** (GCM-202)*	2	a1			
Physical chemistry (GCM-203)	1	a1			
Bioinformatics (GCM-204)	1	a1			
Research Methodology & Ethics (GCM-205)	1	a5			
Scientific writing and Seminar (GCM-206)	1	a7			
Total	8				
Second Semester- *Special Courses (8 C.H.)*					
PDM-201	2	a1, a2, a3, a4	b1, b2, b3	c1, c2, c3	d1, d2
PDM-202	2	a1, a2, a3, a4	b1, b2, b3, b4	c1, c2, c3, c4	d1, d2, d3, d4
PDM-203	2	a1, a2, a3	b1, b2, b3	c1, c2, c3, c4	d1, d2, d3, d4
PDM-204 (E)	2(E)	a1, a2, a3	b1, b2, b3	c1, c2, c3	d1, d2, d3, d4
Total	8				
Thesis	30				
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	K.U*				IS**				P.P.S***				G.T.S****			
		a1	a2	a3	a4	b1	b2	b3	b4	c1	c2	c3	c4	d1	d2	d3	d4
PDM-201	Drug Development	√	√	√	√	√	√	√		√	√	√		√	√		
PDM-202	Drug Pharmacokinetics	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√
PDM-203	Structure Elucidation of Drugs	√	√	√		√	√	√				√	√	√	√	√	√
PDM-204	Synthetic Chemistry of Drugs (E)	√	√	√		√	√	√		√	√	√		√	√	√	√

* ***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*

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6- Student Assessment Methods

6.1- Written exam (special courses).
6.2- Oral exam (special courses).
6.2- Published scientific research paper.
6.3- Public presentation and discussion of the Thesis.

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 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:

9.1-Computers.
9.2- Library and digital library supplied by recent scientific books and journals.

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

9.4- Access to research engines for scientific periodicals in the field of Synthetic Chemistry of Drugs.

10-Thesis

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

Program Coordinator: Prof. Dr. Mohammed M. El-Kerdawy

Head of Department: Prof. Dr. Mohammed Ahmed Moustafa

Signature:

Annex 1

Attach courses and thesis specifications.