



Course Curriculum for Master Degree in Medicinal Chemistry and Pharmacognosy/Medicinal Chemistry

The Master Degree in Medicinal Chemistry and Pharmacognosy/Medicinal Chemistry is awarded by the Faculty of Graduate Studies at Jordan University of Science and Technology (JUST) upon the fulfillment of the following requirements:

1. Compliance with the JUST Master Degree regulations approved by the Dean Council (No. 492/2006), dated 8/8/2006.
2. Successful completion of (34) credit hours in one of the following tracks:

First: Thesis Track

1. Compulsory Requirements: (13) credit hours as follows

Course Code	Course Name	Credit Hours
PHAR 709	Seminar	1
PHAR 720	Research Methodology	2
PHAR 721	Advanced Pharmaceutical Organic Chemistry	3
PHAR 722	Medicinal and Natural Products Analysis	3
PHAR 723	Stereochemistry	2
PHAR 727	Separation and Systematic Identification of Organic Compounds Laboratory	2

2. Elective Requirements: (12) credit hours as follows*

Course Code	Course Name	Credit Hours
PHAR 724	Advanced Physical Organic Chemistry	3
PHAR 725	Advanced Organic Synthesis	3
PHAR 726	Heterocyclic Chemistry	2
PHAR 732	Advanced Biosynthesis	3
PHAR 735	Chromatography	2
PHAR 779A	Special Topics A	3
PHAR 779B	Special Topics B	2
PHAR 779C	Special Topics C	1
PHAR 780	Special Topics in Medicinal Chemistry	2
PHAR 781	Advanced Medicinal Chemistry	2
PHAR 782	Advanced Drug Design	2
PHAR 783	Drug Metabolism	2
PHAR 784	Advanced Radiopharmacy	2
PHAR 785	Enzymes and Drug Action	2

* The student may study not more than 3 credit hours from courses of (700 or 800) level offered by other programs related to his field of study upon approval of the Dean based on the departmental committee recommendation and the approval of the faculty committee of graduate studies.

3. Master thesis (PHAR 799): Total of (9) credit hours as follows

Course Code	Course Name	Credit Hours
PHAR 799A	Master Thesis	9
PHAR 799B	Master Thesis	6
PHAR 799C	Master Thesis	3
PHAR 799D	Master Thesis	0

Second: Non–Thesis Track

1. Compulsory Requirements: (22) credit hours as follows

Course Code	Course Name	Credit Hours
PHAR 709	Seminar	1
PHAR 720	Research Methodology	2
PHAR 721	Advanced Pharmaceutical Organic Chemistry	3
PHAR 722	Medicinal and Natural Products Analysis	3
PHAR 723	Stereochemistry	2
PHAR 725	Advanced Organic Synthesis	3
PHAR 727	Separation and Systematic Identification of Organic Compounds Laboratory	2
PHAR 728	Research Project	3
PHAR 732	Advanced Biosynthesis	3

2. Elective Requirements: (12) credit hours as follows*

Course Code	Course Name	Credit Hours
PHAR 726	Heterocyclic Chemistry	2
PHAR 735	Chromatography	2
PHAR 779A	Special Topics A	3
PHAR 779B	Special Topics B	2
PHAR 779C	Special Topics C	1
PHAR 780	Special Topics in Medicinal Chemistry	2
PHAR 781	Advanced Medicinal Chemistry	2
PHAR 782	Advanced Drug Design	2
PHAR 783	Drug Metabolism	2
PHAR 784	Advanced Radiopharmacy	2
PHAR 785	Enzymes and Drug Action	2

* The student may study not more than 3 credit hours from courses of (700 or 800) level offered by other programs related to his field of study upon approval of the Dean based on the departmental committee recommendation and the approval of the faculty committee of graduate studies.

3. Passing the Comprehensive Exam (PHAR 798): Zero Credit Hour.



Course Curriculum for Master Degree in Medicinal Chemistry and Pharmacognosy/Pharmacognosy

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1. Compliance with the JUST Master Degree regulations approved by the Dean Council (No. 492/2006), dated 8/8/2006.
2. Successful completion of (34) credit hours in one of the following tracks:

First: Thesis Track

1. Compulsory Requirements: (13) credit hours as follows

Course Code	Course Name	Credit Hours
PHAR 709	Seminar	1
PHAR 720	Research Methodology	2
PHAR 721	Advanced Pharmaceutical Organic Chemistry	3
PHAR 722	Medicinal and Natural Products Analysis	3
PHAR 723	Stereochemistry	2
PHAR 727	Separation and Systematic Identification of Organic Compounds Laboratory	2

2. Elective Requirements: (12) credit hours as follows*

Course Code	Course Name	Credit Hours
PHAR 725	Advanced Organic Synthesis	3
PHAR 730	Special Topics in Pharmacognosy	2
PHAR 731	Advanced Natural Products Chemistry	3
PHAR 732	Advanced Biosynthesis	3
PHAR 733	Medicinal Plants Taxonomy	2
PHAR 734	Isolation and Characterization of Natural Products Laboratory	2
PHAR 735	Chromatography	2
PHAR 736	Quality Control of Medicinal Plants	2
PHAR 779A	Special Topics A	3
PHAR 779B	Special Topics B	2
PHAR 779C	Special Topics C	1
PHAR 785	Enzymes and Drug Action	2

* The student may study not more than 3 credit hours from courses of (700 or 800) level offered by other programs related to his field of study upon approval of the Dean based on the departmental committee recommendation and the approval of the faculty committee of graduate studies.

3. Master thesis (PHAR 799): Total of (9) credit hours as follows

Course Code	Course Name	Credit Hours
PHAR 799A	Master Thesis	9
PHAR 799B	Master Thesis	6
PHAR 799C	Master Thesis	3
PHAR 799D	Master Thesis	0

Second: Non–Thesis Track

1. Compulsory Requirements: (22) credit hours as follows

Course Code	Course Name	Credit Hours
PHAR 709	Seminar	1
PHAR 720	Research Methodology	2
PHAR 721	Advanced Pharmaceutical Organic Chemistry	3
PHAR 722	Medicinal and Natural Products Analysis	3
PHAR 723	Stereochemistry	2
PHAR 725	Advanced Organic Synthesis	3
PHAR 727	Separation and Systematic Identification of Organic Compounds Laboratory	2
PHAR 728	Research Project	3
PHAR 732	Advanced Biosynthesis	3

2. Elective Requirements: (12) credit hours as follows*

Course Code	Course Name	Credit Hours
PHAR 730	Special Topics in Pharmacognosy	2
PHAR 731	Advanced Natural Product Chemistry	3
PHAR 733	Medicinal Plants Taxonomy	2
PHAR 734	Isolation and Characterization of Natural Products Laboratory	2
PHAR 735	Chromatography	2
PHAR 736	Quality Control of Medicinal Plants	2
PHAR 779A	Special Topics A	3
PHAR 779B	Special Topics B	2
PHAR 779C	Special Topics C	1
PHAR 785	Enzymes and Drug Action	2

* The student may study not more than 3 credit hours from courses of (700 or 800) level offered by other programs related to his field of study upon approval of the Dean based on the departmental committee recommendation and the approval of the faculty committee of graduate studies.

3. Passing the Comprehensive Exam (PHAR 798): Zero Credit Hour.

Course Descriptions

PHAR 709 Seminar: (1 Credit Hour)

This course aims at teaching the student how to search the available chemical and phytochemical literature concerning a specific topic in these areas, write a scientific report and to present the topic orally using the available multimedia techniques.

PHAR 720 Research Methodology: (2 Credit Hours)

This course provides students with knowledge and skills required to conduct research in a scientific approach. Practical application of different aspects and special problems encountered in research is also discussed.

PHAR 721 Advanced Pharmaceutical Organic Chemistry: (3 Credit Hours)

This course is a prelude to various advanced topics in organic chemistry. It involves a review of the stereochemistry of organic compounds. Functional groups nomenclature, synthesis, and reactions will be studied. Reaction mechanism will be discussed in details.

PHAR 722 Medicinal and Natural Products Analysis: (3 Credit Hours)

This course deals with the qualitative analysis of biologically active compounds using Nuclear Magnetic Resonance (NMR) and Mass Spectroscopy (MS), UV, IR and liquid and gas chromatography. Also new “coupled” techniques like GC/MS, LC/MS and LC/NMR will be studied. Quantitative aspects of these techniques will be of certain emphasis.

PHAR 723 Stereochemistry: (2 Credit Hours)

This course covers the stereochemistry of organic compounds; chirality; resolution and analysis of enantiomers and diastereomers, conformational isomerism and geometrical isomerism. Introduction to stereoselective synthesis and drug design will be given. In addition, stereoselectivity in nature and spectroscopic determination of relative and absolute chirality will be discussed.

PHAR 724 Advanced Physical Organic Chemistry: (3 Credit Hours)

This course covers advanced topics in chemical structures and bonding, mechanism of important classes of chemical reaction, reaction kinetics, acids and bases and aromaticity. Great emphasis will be on the experimental evidence for chemical behavior of organic compounds.

PHAR 725 Advanced Organic Synthesis: (3 Credit Hours)

This course discusses in detail organic reactions and their synthetic utility. Stereoselective synthesis will also be covered. Total synthesis of selected examples will be discussed later in the course.

PHAR 726 Heterocyclic Chemistry: (2 Credit Hours)

This course will cover the fundamentals of heterocyclic compounds; Structure, nomenclature and physical properties. This course will also discuss synthesis and reactions of both aliphatic and aromatic heterocycles with emphasis on five-membered six-membered and fused heterocycles. Selected examples on the synthesis of medicinally important heterocyclic compounds will be given.

PHAR 727 Separation and Systematic Identification of Organic Compounds

Laboratory: (2 Credit Hours)

This is a practical organic chemistry course aimed at learning the techniques of separating organic mixtures as well as systematic identification of organic compounds based on their physical, chemical and spectral properties. Multi-step organic synthesis, purification and identification of a medicinally important organic compound will be also accomplished.

PHAR 728 Research Project: (3 Credit Hours)

This course includes literature search for specific research idea, synthesis or isolation and identification of organic compounds. Student will submit a written report and make an oral presentation of the research results.

PHAR 730 Special Topics in Pharmacognosy: (2 Credit Hours)

This course is designed to cover the up-to-date aspects of medicinal herbs such as: quality control, herb selection, extraction and standardization, registration and regulation, raw material and production.

PHAR 731 Advanced Natural Products Chemistry: (2 Credit Hours)

New natural products as well as new topics in natural products will be studied in this course. Topics like microbiological conversion of chemical compounds, fungus, algae and microorganism secondary metabolites, marine natural compounds, activity guided isolation and fractionation will be of certain emphasis.

PHAR 732 Advanced Biosynthesis: (3 Credit Hours)

This course deals with natural products from a biosynthetic point of view. Emphasis will be on biosynthetic techniques, mechanism, and pathways leading to the major natural products classes.. Enzyme chemistry will also be studied.

PHAR 733 Medicinal Plants Taxonomy: (2 Credit Hours)

This course covers the identification and classification of gymnosperms and angiosperms (monocots and dicots). This course also covers plant nomenclature and source of taxonomic evidence.

PHAR 734 Isolation and Characterization of Natural Products Laboratory: (2 Credit Hours)

This course will cover special techniques of certain importance in phytochemical research such as extraction procedures, open column chromatography, thin layer chromatography (TLC), preparative HPLC, GC, GC/MS and LC/MS.

PHAR 735 Chromatography: (2 Credit Hours)

This course is designed to provide the students with a comprehensive theoretical background for the most useful and modern chromatographic methods and techniques. In addition, some useful recent applications are also discussed.

PHAR 736 Quality Control of Medicinal Plants: (3 Credit Hours)

This course will cover all aspects related to herbal drugs and their evaluation, sampling, macroscopical and microscopical examination, qualitative and quantitative analyses. Tests for adulteration and pollutants, storage and preservation methods are also discussed.

PHAR 779A Special Topics A: (3 Credit Hours)

Special topics in advanced pharmaceutical sciences are discussed.

PHAR 779B Special Topics B: (2 Credit Hours)

Special topics in advanced pharmaceutical sciences are discussed.

PHAR 779C Special Topics C: (1 Credit Hour)

Special topics in advanced pharmaceutical sciences are discussed.

PHAR 780 Special Topics in Medicinal Chemistry: (2 Credit Hours)

This course is designed to cover the up-to-date aspects of medicinal chemistry such as: computer-aided drug design, combinatorial chemistry, and new drug classes.

PHAR 781 Advanced Medicinal Chemistry: (2 Credit Hours)

The course deals with new trends in medicinal chemistry and drug discovery. Detailed discussion of receptor theories and quantitative structure activity relationships will be discussed. Advanced topics in the metabolism of xenobiotics and related organic compounds are studied in details.

PHAR 782 Advanced Drug Design: (2 Credit Hours)

The course covers new approaches to rational drug design and their applications. Computer aided drugs design will be covered. Drugs design of selected examples will be discussed in detail.

PHAR 783 Drug Metabolism: (2 Credit Hours)

This course is aimed at the study of drug metabolic processes. Phases, reactions, and reaction mechanisms of metabolic pathways will be discussed in details. In addition, factors affecting drug metabolism and drug-metabolizing enzyme systems will be examined.

PHAR 784 Advanced Radiopharmacy: (2 Credit Hours)

This course covers various and up-to-date aspects of radiation technology in pharmacy, medicine and health industry. Diagnosis and treatment using radioisotopes and radio-pharmaceuticals will be emphasized.

PHAR 785 Enzymes and Drug Action: (2 Credit Hours)

This course covers subjects related to mechanisms of enzyme inhibition such as transition state analogs, reaction coordinate analogs and irreversible mechanism-based enzyme inhibitors.

PHAR 798 Passing the Comprehensive Exam: (Zero Credit Hours)

In this course the student will set for an exam that includes all topics addressed throughout his academic program either from inside faculty of pharmacy or outside faculty of pharmacy. Comprehensive exam will be held inside school of pharmacy under the supervision of specialized faculty members.

PHAR 799 Master Thesis: (9 Credit Hours)

Individual research under the direction of a faculty member (s) and committee leading to preparation, completion, and oral defense of a thesis.