Jordan University of Science and Technology

Faculty of Pharmacy

Department of Clinical Pharmacy

Curriculum of M.Sc. program in Pharmacology and Experimental Therapeutics

2024

The master's degree in Pharmacology and Experimental Therapeutics is awarded by the Faculty of Graduate Studies at Jordan University of Science and Technology (JUST) upon the fulfillment of JUST running master's degree regulations and the Successful completion of (34) credit hours in the *master thesis track* or *comprehensive examination track* including compulsory and elective courses as follow:

Classification	Credit hours			
	Department compulsory	Department elective	Specialization compulsory	Total
Master Thesis track	16	9	9	34
Comprehensive Examination Track	25	9	0	34

Master Thesis track

1. Department compulsory requirements: (16 Credit Hours)

Course No.	Course title	Credit hours	Prerequisite Courses
Phar. 700	Scientific Writing and Research Ethics	2	---
Phar. 702	Applied Statistics	2	---
Phar. 769	Molecular and Cellular Biology	3	---
Phar. 770	Seminar	0	---
Phar. 771	Principles of Experimental Therapeutics	3	---
Phar. 772	Advanced Pharmacological Sciences	3	studying Phar. 769
Phar. 773	Applied Techniques in Translational Pharmacology	3	---
Total		**16**	

2. Department elective requirements: (9 credit hours)

Course No.	Course title	Credit hours	Prerequisite Courses
Phar. 717	Biomarkers in Clinical Research	2	---
Phar. 728	Advanced Pharmacokinetics and Pharmacodynamics	3	---
Phar. 729	Pharmacogenetics in Health and Disease	3	---
Phar. 736	Aspects of Drug Development	2	---
Phar. 737	Clinical Pharmacology	3	---
Phar. 738	Selected Topics in Translational Sciences	3	---
Phar. 739	Principles of Research Design and Drug Literature Evaluation	1	---
Phar. 754	Drug Delivery Systems	3	---
Phar. 774	Receptors and Drug Targets	2	---
Phar. 775	General Studies in Toxicology	3	---
Phar. 776	Cellular and Molecular Toxicology	3	---
Phar. 777	Immunology and Immunotherapeutics	3	---
Phar. 778	Behavioral Pharmacology	2	---
Phar. 779A	Special Topics (A)	3	---
Phar. 779B	Special Topics (B)	2	---
Phar. 779C	Special Topics (C)	1	---
Phar. 780	Cell Signaling	3	---

3. Specialization compulsory requirements: (9 credit hours)

Course No.	Course title	Credit hours
Phar. 799A	Master Thesis	9
Phar. 799B	Master Thesis	6
Phar. 799C	Master Thesis	3
Phar. 799D	Master Thesis	0

Comprehensive Examination Track

1. Department compulsory requirements: (25 Credit Hours)

Course No.	Course title	Credit hours	Prerequisite Courses
Phar. 700	Scientific Writing and Research Ethics	2	---
Phar. 702	Applied Statistics	2	---
Phar. 728	Advanced Pharmacokinetics and Pharmacodynamics	3	---
Phar. 729	Pharmacogenetics in Health and Disease	3	---
Phar. 737	Clinical Pharmacology	3	---
Phar. 769	Molecular and Cellular Biology	3	---
Phar. 770	Seminar	0	---
Phar. 771	Principles of Experimental Therapeutics	3	---
Phar. 772	Advanced Pharmacological Sciences	3	Studying Phar. 769
Phar. 773	Applied Techniques in Translational Pharmacology	3	---
Total		**25**	

2. Department elective requirements: (9 credit hours)

Course No.	Course title	Credit hours	Prerequisite Courses
Phar. 717	Biomarkers in Clinical Research	2	---
Phar. 736	Aspects of Drug Development	2	---
Phar. 738	Selected Topics in Translational Sciences	3	---
Phar. 739	Principles of Research Design and Drug Literature Evaluation	1	---
Phar. 754	Drug Delivery Systems	3	---
Phar. 774	Receptors and Drug Targets	2	---
Phar. 775	General Studies in Toxicology	3	---
Phar. 776	Cellular and Molecular Toxicology	3	---
Phar. 777	Immunology and Immunotherapeutics	3	---
Phar. 778	Behavioral Pharmacology	2	---
Phar. 779A	Special Topics (A)	3	---
Phar. 779B	Special Topics (B)	2	---
Phar. 779C	Special Topics (C)	1	---
Phar. 780	Cell Signaling	3	---

3. Specialization compulsory requirements: (0 credit hour)

Course No.	Course title	Credit hours	Prerequisite Courses
Phar. 798	Comprehensive Exam	0	Passing 34 credit hours successfully.

Course description

- **Phar. 700 Scientific Writing and Research Ethics (2 credit hours)**

This course covers the topics relevant to research methods, including, literature search, principles of scientific writing, research proposal, thesis preparation, and manuscript writing. It focuses on aspects in research ethics, research misconduct, data management and presentation, human participants and animal subjects in research, and laboratory safety. This will be covered by writing a research proposal of a selected subject of the student's interest.

- **Phar. 702 Applied Statistics (2 credit hours)**

This course will cover descriptive statistics and statistical inference relevant to health care research, including basic principles in data analysis, correlation analysis, analysis of variance, linear regression and logistic regression. Students will also learn how to conduct data analysis using statistical software.

- **Phar. 717 Biomarkers in Clinical Research (2 credit hours)**

This course will cover biomarkers and their applications in clinical research. It will emphasize on quantitative and qualitative tests used to assess biomarkers. In addition, it focusses on the analysis and interpretation of biomarkers data in relation to drug efficacy and safety as well as clinical outcomes**.**

- **Phar. 728 Advanced Pharmacokinetics and Pharmacodynamics (3 credit hours)**

This course provides an overview of the different aspects of pharmacokinetics and pharmacodynamics of drugs. Those include different features of drug absorption, distribution, metabolism and excretion in addition to drug target (receptor, enzyme, transporter, etc.) interactions. The course also emphasizes on analysis and interpretation of kinetics data, and the clinical application of theories describing drug kinetics.

- **Phar. 729 Pharmacogenetics in Health and Disease (3 credit hours)**

This course will study human genetics variations and their effect on health and disease. The course will provide the knowledge necessary to understand pharmacogenomics including research design and methods/ techniques used in genetics research. The course will emphasize the concepts of personalized medicine.

- **Phar. 736 Aspects of Drug Development (2 credit hours)**

This course is intended to provide students with the knowledge, implementation and appreciation of the pharmacological and molecular biology principles to the latest biomedical and biotechnological challenges. It provides an overview of the journey of drug development, starting from early phases of drug discovery, target identification into drug registration and post marketing studies applied on that product.

- **Phar. 737 Clinical Pharmacology (3 credit hours)**

This course covers the mechanism of action of certain drugs, and their adverse effects profile. Moreover, this course will explain the rational for using certain drugs in clinical practice to treat pathological diseases based on the drugs' pharmacodynamic/pharmacokinetic profile. The course will discuss different aspects dealing with drug monitoring, reasons behind adverse effects development, and common features in clinical toxicology.

- **Phar. 738 Selected Topics in Translational Sciences (3 credit hours)**

This course will cover recent and emergent topics related to experimental therapeutics and translational pharmacology.

- **Phar. 739 Principles of Research Design and Drug Literature Evaluation (1 credit hour)**

This course is designed to emphasize the fundamental concepts in research design. This course will guide the graduate students through a literature review on a topic of their own choice. It provides graduate students with the skills required to search several databases, and to establish an organized philosophical framework that will help them in crucially evaluating the theoretical arguments of others.

- **Phar. 754 Drug Delivery Systems (3 credit hours)**

This course is designed to cover the theoretical aspects related to controlled drug delivery systems, this include properties affecting system design, methodologies in various drug delivery systems, dosage forms with prolonged and sustained action, physical, chemical and pharmacokinetics consideration encountered in the design of drug delivery systems will also be discussed.

- **Phar. 769 Molecular and Cellular Biology (3 credit hours)**

This course is designed to provide students with the fundamental structural and functional units of the cell. Discussion will focus on the basic features of cells, genetic concepts and regulation, cell cycle control, internal organization of cells, and cell-cell interactions. Additionally, this course will cover a number of topics related to cellular signaling and the pathways that affect basic aspects of cell growth, division, and death. The course will also cover the knowledge necessary to understand protein synthesis, intracellular protein transport system, and protein degradation in eukaryotic cells. Many of these aspects will be reviewed in the context of how defects in such cellular processes produce pathological diseases.

- **Phar. 770 Seminar (0 credit hours)**

This course is designed so students present their research ideas/findings as seminars.

- **Phar. 771 Principles of Experimental Therapeutics (3 credit hours)**

This course introduces key principles, trends and methods for research in experimental therapeutics by application of pharmacological principles to the development of new therapies. The format of this course is designed to challenge students to critically think about the experimental and clinical problems and help them identify approaches toward solving these problems. Topics will cover current approaches for treatment of human diseases, risk assessment and management, biomarker selection, surrogate endpoints, drug discovery using nucleic acids, stem cells and bioengineered tissues, drug adverse effects and

interaction, and design of pre-clinical and clinical studies for development of novel therapies. The course will discuss principles in developing animal models of human diseases using drugs, diets, devices and genetic technologies as examples.

- **Phar. 772 Advanced Pharmacological Sciences (3 credit hours) (Prerequisite Course: Studying Phar. 769)**

This is a comprehensive pharmacology course that emphasizes on recent advances in the understanding of pharmacological principles. The course appraises the cellular and molecular biology of signal transduction and will provide a more detailed discussion of the molecular pharmacology of receptors, channels and enzymes. This course will focus also on the receptor theory, receptor-ligand interactions, receptors and signal transduction, protein structure-activity relationships, concepts of proteins scaffolding and trafficking, genomic regulation of drugs action, and pharmacogenomics. Many of these aspects will be reviewed in the context of how defects in such molecular processes produce pathological diseases.

- **Phar. 773 Applied Techniques in Translational Pharmacology (3 credit hours)**

This course represents a series of didactic lectures focusing on the laboratory and analytical techniques used in experimental therapeutics and translational pharmacology research along with complimentary laboratory exercises and demonstrations. Additionally, this course aims to develop the students' critical skills of designing pharmacological experiments.

- **Phar. 774 Receptors and Drug Targets (3 credit hours)**

This course represents a series of didactic lectures focusing on the laboratory and analytical techniques used in experimental therapeutics and translational pharmacology research along with complimentary laboratory exercises and demonstrations. Additionally, this course aims to develop the students' critical skills of designing pharmacological experiments.

- **Phar. 775 General Studies in Toxicology (3 credit hours)**

This course will give an overview of general toxicological principles, toxic substances and their effects. The course is designed to study the adverse effects of chemical, physical, or biological agents on people, animals, and the environment. Additionally, this course will cover the study of the nature and actions of chemicals on the biological systems.

- **Phar. 776 Cellular and Molecular Toxicology (3 credit hours)**

This course is designed to enable student to understand, at the molecular level, the mechanisms behind certain substances toxicity and the relations between the cellular body defense systems against their toxicity. This course will discuss the recent advances within literature and the development in cellular and molecular toxicology.

- **Phar. 777 Immunology and Immunotherapeutics (3 credit hours)**

This course provides an overview of the immune system and clinical applications of immunology. This course will cover different aspects dealing with the fundamentals of immunology to clinical applications in infectious disease, transplantation, HIV, cancer, autoimmunity, infection and neurodegeneration and

how cutting-edge immunotherapies are revolutionizing the treatment of life-threatening and debilitating diseases. The exciting technologies of DNA/RNA vaccines, antibody, stem cell, CAR T-cell therapies, and immune-checkpoint blockade will be studied.

- **Phar. 778 Behavioral Pharmacology (2 credit hours)**

This course will explore the neurochemical, physical and mental effects of commonly used psychoactive substances on the human biological system. Emphasis is placed on the basic pharmacology of psychoactive drugs, the medical consequences of compulsive illicit use, and therapeutic approaches for managing substance use disorders. This course will also review the major classes of drugs that are of clinical significance in treating the major categories of psychiatric disorders: anxiety, depression, mania, and schizophrenia.

- **Phar. 779A Special Topics (A) (3 credit hours)**

This course covers special topics in the field of pharmacology and experimental therapeutics.

- **Phar. 779B Special Topics (B) (2 credit hours)**

This course covers special topics in the field of pharmacology and experimental therapeutics.

- **Phar. 779C Special Topics (C) (1 credit hour)**

This course covers special topics in the field of pharmacology and experimental therapeutics.

- **Phar. 780 Cell Signaling (3 credit hours)**

This course discusses the basic molecular mechanisms of signal transduction pathways related to cell growth, cell cycle, differentiation, apoptosis, and motility. The course will also cover topics related to signaling receptors and the principles of inter- and intracellular signaling pathways. These signaling pathways will be discussed regarding their role in homeostasis and human diseases.

- **Phar. 798 Comprehensive Exam (0 credit hours) (Prerequisite Course: Passing 34 credit hours successfully)**

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

- **Phar. 799 (A, B, C, D) Master Thesis (9, 6, 3, 0 credit hours)**

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

Study Plan – Master Thesis Track

First year							
First Semester				**Second semester**			
Course No.	Course title	Credit hours	Pre-requisites	Course No.	Course title	Credit hours	Pre-requisites
Phar. 700	Scientific Writing and Research Ethics	2	-	Phar. 771	Principles of Experimental Therapeutics	3	-
Phar. 702	Applied Statistics	2	-	Phar. 772	Advanced Pharmacological Sciences	3	Studying Phar. 769
Phar. 769	Molecular and Cellular Biology	3	-		Department elective course	3	-
	Total	**7**			**Total**	**9**	

Second year							
First semester				**Second semester**			
Course No.	Course title	Credit hours	Pre-requisites	Course No.	Course title	Credit hours	Pre-requisites
Phar. 770	Seminar	0	-	Phar. 799A	Master Thesis	**9**	-
Phar. 773	Applied Techniques in Translational Pharmacology	3	-				
	Department elective course	3	-				
	Department elective course	3	-				
	Total	**9**			**Total**	**9**	

Study Plan - Comprehensive Examination Track

First year							
First Semester				**Second semester**			
Course No.	Course title	Credit hours	Pre-requisites	Course No.	Course title	Credit hours	Pre-requisites
Phar. 700	Scientific Writing and Research Ethics	2	-	Phar. 771	Principles of Experimental Therapeutics	3	-
Phar. 702	Applied Statistics	2	-	Phar. 772	Advanced Pharmacological Sciences	3	Studying Phar. 769
Phar. 769	Molecular and Cellular Biology	3	-		Department elective course	3	-
	Total	**7**			**Total**	**9**	

Second year							
First semester				**Second semester**			
Course No.	Course title	Credit hours	Pre-requisites	Course No.	Course title	Credit hours	Pre-requisites
Phar. 728	Advanced Pharmacokinetics and Pharmacodynamics	3	-	Phar. 729	Pharmacogenetics in Health and Disease	3	-
Phar. 770	Seminar	0	-	Phar. 737	Clinical Pharmacology	3	-
Phar. 773	Applied Techniques in Translational Pharmacology	3	-		Department elective course	3	-
	Department elective course	3	-				
	Total	**9**			**Total**	**9**	

Third year			
First semester			
Course No.	Course title	Credit hours	Pre-requisites
Phar. 798	Comprehensive Exam	0	Passing 34 credit hours successfully.
	Total	**0**	