

Faculty of Pharmacy

**Department of Basic
Pharmaceutical Sciences**

**& Department of Applied
Pharmaceutical Sciences and
Clinical Pharmacy**

**Study Plan for the Bachelor Degree in
Pharmacy**

2019 / 2020

Vision:

"To be a model for high quality pharmacy education and innovative research"

Mission:

"To achieve the highest quality standards in higher education and scientific research and to produce exceptionally skilled pharmacists capable of excelling professionally"

Program Objectives:

1. Qualify the students in pharmaceutical sciences, pharmaceutics, clinical pharmacy, and related sciences to facilitate their performance in different pharmaceutical fields.
2. Perfecting the student skills to become an integral part of the staff in the area they have been assigned and develop the health care system.
3. Expose the students to the latest standards and guidance related to pharmacy practice, and comply with all the laws related to pharmacy.
4. Provide the students with the skills to utilize all research methodologies and assess the literature and other research resources to develop pharmacy profession.
5. Encourage students' creative thinking and leadership to develop innovative means of accomplishing professional objectives.
6. Develop the students' interpersonal, oral, and written communication skills with patient and health care professionals.
7. Develop student capability to solve problems effectively and objectively evaluate proposed solutions based on sound scientific basis in all pharmacy related aspects

Intended Learning Outcomes (ILOs):

Knowledge and Understanding:

1. Demonstrate the knowledge and ability to relate and recall basic principles of chemistry, physics, biochemistry, biology, microbiology, mathematics, statistics, anatomy, physiology, and organic chemistry to various pharmaceutical applications.
2. Demonstrate knowledge of medication action, uses, side effects, physicochemical properties, and medication management.
3. Demonstrate knowledge and compliance with legal principles and regulatory requirements in the practice of pharmacy

Intellectual skills:

4. Assess drug prescription for safety, efficacy, dosage form selection, cost effectiveness, and possible drug interactions.
5. Utilize pharmaceutical and pharmacokinetic principles to conduct accurate medication calculations.
6. Interpret medical cases (Lab tests, physical examination, and diagnosis) to identify, assess, and solve medication related problems.

Subject specific skills:

7. Demonstrate the ability for safe and accurate evaluation, compounding, and dispensing of prescribed, over the counter medications, and cosmetics in appropriate dosage forms.
8. Utilize knowledge obtained from various pharmaceutical sciences to provide patient centered care as medication expert.
9. Propose, implement, evaluate, modify, and monitor pharmacotherapy care plan.
10. Utilize pharmaceutical technology in dosage form development, characterization, and evaluation.
11. Integrate non-pharmacological, nutritional, herbal and alternative therapies in health care plan.
12. Apply scientific professional information on pharmaceutical care.
13. Handle purchases and demonstrate administrative and inventory management in community pharmacy.

Transferable skills:

14. Demonstrate appropriate ethical and professional behavior and comply with all laws and regulation related to pharmacy practice.
15. Utilize effective oral and written communication skills to collaborate with health care professionals for optimum therapeutic outcome.
16. Recommend, advise and monitor therapeutic regimen with patient in an evidence based manner.
17. Demonstrate effective interpersonal communication to educate the society about drug related healthcare and promote population pharmaceutical care.
18. Manage adverse drug reactions, medication errors, and patient compliance in collaboration with other healthcare professionals.

1. Requirements For a Bachelor Degree in Pharmacy (160) Credit Hours

Classification	Credit Hours	Percentage
University Requirements	12	% 15
Faculty Requirements	27	% 17
Program Compulsory Requirements	97	% 60.5
Program Elective Requirements	9	% 5.5
Free Electives	3	%2
Total	160	%100

Course Numbering:

Faculty code: (05)

Basic pharmaceutical sciences department code: (01)

Applied pharmaceutical sciences department code: (02)

0	5	0	1	1	1	0	1
0	5	0	2	1	1	0	1
Faculty Code		Dept. Code		Course Level		Knowledge Field	Sequence

Knowledge Areas

Number	Knowledge Field	Credit Hours
0	General Basic Sciences	47
1	Foundational Knowledge	28
2	Essentials for Practice and Care	31
3	Approach to Practice and Care	5
4	Personal and Professional Development	1
5	Pharmaceutical product expert	12
6	Faculty elective courses	9
	Total	133

2. University Requirements: (24 Credit Hours)

2.1. Compulsory University Requirements: (12 Credit Hours)

Course No.	Course Title	Cr. Hr.	Prerequisite	Co-requisite
01101101	Military Sciences	3	0	0
01101102	Arabic Language	3	0	0
01101111	English Language	3	0	0
01101112	National Education	3	0	0
	Total	12		

2. 2. Elective: 12 Credit Hours from the following courses.

Course No.	Course Title	Cr. Hr.	Prerequisite	Co-requisite
01101103	Traffic Education	3	-	-
01101104	Innovation and Entrepreneurship	3	-	-
01101121	Life Skills	3	-	-
01101131	Islamic Education	3	-	-
01101132	Jerusalem and the Hashemite Custodianship	3	-	-

01101141	Sport and Health	3	-	-
01101142	Environment and Society	3	-	-
01101151	Computer Skills	3	-	-
01101152	Internet and Communication	3	-	-
01101161	Economic Systems and Concepts	3	-	-
01101171	Psychology and Society	3	-	-
01101213	Communication Skills in Arabic	3	01101111	-
01101214	Communication Skills in English	3	01101112	-
01101243	Safety and First Aid	3	-	-
01101281	Scientific Research Methods	3	-	-
01101282	Introduction to Astronomy	3	-	-
03011101	Law in our Life	3	-	-
03021201	Human Rights	3	-	-

3. Faculty Requirements: (27 Credit Hours)

Course No.	Course Title	Cr. hr.	Prerequisite	Co-requisite
11031101	Calculus (1)	3	-	-
11021105	General Physics for Pharmacy	3	-	-
11011105	General Chemistry for Pharmacy	3	-	-
11011106	General Chemistry Lab for Pharmacy	1	11011105	11011105
11011281	General Biology	3	-	-
11011282	General Biology lab	1	-	-
05011210	Pharmaceutical Organic Chemistry (1)	3	11011106	-
05011211	Pharmaceutical Organic Chemistry (2)	3	05011210	-
05012112	Pharmaceutical Organic Chemistry Lab.	1	05011211	05011211
05011201	Anatomy & Histology	2	11011282	-
05011202	Anatomy & Histology Lab.	1	05011201	05011201
05011203	Physiology	3	05011202	-

4. Program Compulsory Requirements (106 Credit Hours)

4.1 Program Compulsory Requirements: (97 Credit Hours)

Course No.	Course Title	Cr. hr.	Prerequisite	Co-requisite
05011213	Pharmaceutical Analytical Chemistry	3	11011106	-
05012201	Pathophysiology	3	05011203	-
05012114	Pharmaceutical Instrumental Analysis	3	05011213	-
05012115	Pharmaceutical Analytical Chemistry & Instrumental Analysis Lab	1	05012114	05012114

Course No.	Course Title	Cr. hr.	Prerequisite	Co-requisite
05022111	Physical Pharmacy	3	11021105	-
05022112	Physical Pharmacy Lab.	1	05022111	05022111
05022211	Pharmaceutical Biochemistry	3	05022112	-
05022212	Pharmaceutical Biochemistry Lab.	1	05022211	05022211
05012101	General Microbiology	3	05012201	-
05022221	Pharmacognosy	3	05012115	-
05022213	Phytochemistry	3	05022221	-
05022214	Phytochemistry Lab.	1	05022213	05022213
05022215	Pharmaceutics	3	05022112	-
05022216	Pharmaceutics Lab.	1	05022215	05022215
05023151	Industrial Pharmacy	3	05022216	-
05023152	Industrial Pharmacy Lab.	1	05023151	05023151
05023111	Medicinal Chemistry 1	3	05022212	05022212
05023211	Medicinal Chemistry 2	3	05023111	-
05023121	Pharmacology 1	3	05012201 05022212	-
05023212	Medicinal Chemistry Lab.	1	05023211	05023211
05013211	Pharmaceutical Microbiology	3	05012101 05023212	-
05013212	Pharmaceutical Microbiology Lab.	1	05013211	05013211
05024111	Immunology & Vaccines	2	05013212	05013212
05023221	Pharmacology 2	3	05022221	-
05024121	Clinical Biochemistry	3	05022212 05023221	-
05024122	Clinical Biochemistry Lab.	1	05024121	05024121
05024113	Medicinal Chemistry 3	3	05023212	-
05024124	Pharmacology 3	3	05023221	-
05023101	Biostatistics	2	11031101	-
05024211	Biopharmaceutics & Pharmacokinetics	3	05023152 05023121	-
05024212	Biopharmaceutics & Pharmacokinetics Lab.	1	05024211	05024211
05023122	Over the counter medications	3	05023221	-
05024251	Drug Design	3	05024123	-
05024221	Toxicology	2	05024124	-
05024222	Pharmacology & Toxicology Lab.	1	05024221	05024221
05025151	Pharmaceutical Biotechnology	3	05013212 05024122	-
05025121	Clinical Pharmacy & Therapeutic 1	3	05024123	-
05025221	Clinical Pharmacy & Therapeutic 2	3	05025121	-
05025132	Case studies in therapeutics	1	05025121	05025121
05025231	Pharmacy Legislation & Ethics	1	05023221	-

Course No.	Course Title	Cr. hr.	Prerequisite	Co-requisite
05025242	Pharmacy Practice Lab.	1	05025221	05025221
05023251	Cosmetics	2	05023152	-
05025233	Pharmacoeconomics	3	05024123	-
Total		97		

4.2 Program Elective Requirements: (9 Credit Hours)

Course No.	Course Title	Cr. hr.	Prerequisite	Co-requisite
05023161	Pharmaceutical principles & medicinal terminology	3	-	-
05023261	Drug Information	3	05024123	-
05025261	special topics in pharmacy 1	1	Graduate semester	-
05023263	Pharmacoinformatics	3	05024123	-
05025262	special topics in pharmacy 2	2	Graduate semester	-
05023264	Pharmaceutical Quality Assurance and Quality Control	3	05023152	-
05024161	Communication Skills in Pharmacy	3	05024123	-
05025263	Research Project & Seminar	3	Graduate semester	-
05023262	Pharmaceutical Dosage Forms	3	05023152	-
05023265	Therapeutic Drug Monitoring	3	05024123	-
05024162	Advanced Pharmacology	3	05024123	-
05024163	Pharmacovigilance	3	05025221	-
05024261	Medical Parasites	1	05013212	-
05023162	Public Health	3	05024123	-
05023163	Applied pharmacognocny	3	05022214	-
05024262	Pharmaceutical Health Care	2	05025221	-
05024263	Hospital Pharmacy	3	05025221	-
05025161	Pharmaceutical Marketing	3	05025233	-
Total				

Free Electives: (3 Credit Hours)

Student chooses one subject of three credit hours from subjects offered by the University

Guidance:

- Non Jordanian student are allowed substitutes for Military Sciences and National education if they choose to do so.
- Practical Pharmacy training: This training should be accredited by the ministry of health and from the Jordanian Pharmaceutical Association for duration of (1440) hours, this training starts when the student has passed (70) credit hours.

Study Plan Guide for the Bachelor Degree in Pharmacy

First Year				
First Term				
Course No.	Course Title	Cr. hrs.	Prerequisite	Co-requisite
01101102	Arabic Language	3		
11011101	General Chemistry for Pharmacy	3		
11011106	General Chemistry for Pharmacy (Lab)	1	11011101	11011101
11031101	Calculus (1)	3		
11021105	General physics for Pharmacy	3		
11011281	General Biology	3		
11011282	General Biology (Lab)	1	11011281	11011281
	Total	17		
Second Term				
Course No.	Course Title	Cr. hrs.	Prerequisite	Co-requisite
05011213	Pharmaceutical Analytical Chemistry	3	11011106	
05011210	Pharmaceutical Organic Chemistry (1)	3	11011106	
01101111	English Language	3		
05011203	Physiology	3	05011202	
05011201	Anatomy & Histology	2	11011282	
05011202	Anatomy & Histology (Lab)	1	05011201	05011201
	Total	15		

Second Year				
First Term				
Course No.	Course Title	Cr. hrs.	Prerequisite	Co-requisite
05012114	Pharmaceutical Instrumental Analysis	3	05011213	
05012115	Pharmaceutical Analytical Chemistry & Instrumental Analysis Lab	1	05012114	05012114
05011211	Pharmaceutical Organic Chemistry (2)	3	05011210	
05011212	Pharmaceutical Organic Chemistry Lab.	1	05011211	05011211
05022111	Physical Pharmacy	3	11021105	
05022112	Physical Pharmacy Lab.	1	05022111	05022111
05012201	Pathophysiology	3	05011203	
	Total	15		
Second Term				
Course No.	Course Title	Cr. hrs.	Prerequisite	Co-requisite
05022213	Phytochemistry	3	05022221	
05022214	Phytochemistry Lab.	1	05022213	05022213
05022211	Pharmaceutical Biochemistry	3	05012115	
05022212	Pharmaceutical Biochemistry Lab	1	05022211	05022211
05022215	Pharmaceutics	3	05022112	
05022216	Pharmaceutics (Lab)	1	05022215	05022215
05012101	General Microbiology	3	05012201	
	University Requirement	3		
	Total	18		

Third Year				
First Term				
Course No.	Course Title	Cr. hrs.	Prerequisite	Co-requisite
05022221	Pharmacognosy	3	05012115	
05023111	Medicinal Chemistry (1)	3	05022212	05022212
05023151	Industrial Pharmacy	3	05022216	
05023152	Industrial Pharmacy Lab	1	05023151	05023151
05023121	Pharmacology (1)	3	05012201 05022212	
	University Requirement	3		
	Total	16		
Second Term				
Course No.	Course Title	Cr. hrs.	Prerequisite	Co-requisite
	Free Electives	3		
	University Requirement	3		
05023211	Medicinal Chemistry (2)	3	05023111	
05023212	Medicinal Chemistry Lab	1	05023211	05023211
05023221	Pharmacology (2)	3	05023121	
05013211	Pharmaceutical Microbiology	3	05012101 05023212	
05013212	Pharmaceutical Microbiology Lab	1	05013211	05013211
	Total	17		

Fourth Year				
First Term				
Course No.	Course Title	Cr. hrs.	Prerequisite	Co-requisite
	University Requirement	3		
05024113	Medicinal Chemistry (3)	3	05023212	
05024121	Clinical Biochemistry	3	05022212 05023221	
05024122	Clinical Biochemistry Lab	1	05024121	05024121
05024124	Pharmacology (3)	3	05023221	
05024111	Immunology & Vaccine	2	05013212	05013212
	Total	15		
Second Term				
Course No.	Course Title	Cr. hrs.	Prerequisite	Co-requisite
05024251	Drug Design	3	05024123	
	University Requirement	3		
05023122	Over the counter medications	3	05024124	
05024221	Toxicology	2	05024124	
05024222	Pharmacology & Toxicology Lab	1	05024221	05024221
05024211	Biopharmaceutics & Pharmacokinetics	3	05023152 05023121	
05024212	Biopharmaceutics & Pharmacokinetics Lab	1	05024211	05024211
	Total	16		

Fifth Year				
First Term				
Course No.	Course Title	Cr. hrs.	Prerequisite	Co-requisite
05025121	Clinical Pharmacy & therapeutics (1)	3	05024124	
	Department Elective requirement	3		
05025132	Case Studies in therapeutics	1	05025121	05025121
05025231	Pharmacy Legislation & Ethics	1	05023221	
05025242	Pharmacy Practice Lab.	1	05024124	05025232
05023251	Cosmetics	2	05023152	05023251
05025151	Pharmaceutical Biotechnology	3	05013212 05024122	05025151
05023101	Biostatistics	2	11031101	05023101
	Total	15		
Second Term				
Course No.	Course Title	Cr. hrs.	Prerequisite	Co-requisite
05025221	Clinical Pharmacy & therapeutic (2)	3	05025121	
05025233	Pharmacoeconomics	3	05024124	
	Department Elective requirement	3		
	Department Elective requirement	3		
	University Requirement	3		
	Total	15		

Courses Description

11031101 Calculus (1) (3 Cr. Hr.):

This course aims at covering the following topics: functions (exponential and logarithmic) and limits, continuity of trigonometric, exponential and inverse function, derivative of function, Application of derivative (increasing, decreasing and concavity), integral and application of derivative.

11021105 General Physics for Pharmacy (3 Cr. Hr.):

This course is an introduction to physics for pharmacy students. Topics include kinematics and dynamics of particles; momentum, work, and energy; gravitation; circular, angular, and harmonic motion.

11011105 General Chemistry for Pharmacy (3 Cr. Hr.):

This course provides the students with the scientific measurements, arithmetical relationships for chemical compounds and chemical reactions, atomic structure, molecular structure, periodic chart, chemical bonding, gases and their laws, states of matter and forces among molecules, properties of water solution. The course aims to make students able to carry chemical calculations, to enhance their abilities of subjects related to analytical and physical chemistry, such as properties of gases, kinetics, chemical equilibrium, and acid-base equilibrium. Also chemical thermodynamics and chemical kinetics.

11011106 General Chemistry Lab for Pharmacy (1 Cr. Hr.): Prerequisite: 11011105, Co-request: 11011105

The course is designed to provide the students with basic laboratory techniques, and identification of physical and chemical properties of matter, and how to determine the empirical formula of compounds and hydrated salts, also to demonstrate titrimetric analysis methods and chemical.

11011281 General Biology (3 Cr. Hr.):

This course provides the students with the basic information's regarding the chemical behavior of carbon which makes it exceptionally versatile as a building block in molecular architecture, structure and function of nucleic acids, cell organelles and cell membrane, the total chemical reactions that takes place in living organisms, certain aspects of cellular respiration, the molecular and chromosomal basis of inheritance and the connection between genes and proteins. It also includes the types of plant cells, tissue system and plant growth, levels of animal structure organization, types and function of animal tissues, the kingdoms of life, and characteristics of prokaryotes, protists and fungi. Some of the most important phyla of invertebrates and the immune system are described.

11011282 General Biology Lab (1 Cr. Hr.):

This course deal with the study of cell structures, chemical constituents of living cell and cellular activities (modes of reproduction, enzyme activities, physical properties, respiration and photosynthesis). The course also includes the study of plant and animal tissues and organs, mice anatomy, diversity of organisms, genetics and media preparation.

05011210 Pharmaceutical Organic Chemistry (1): (3 Cr.Hr.), Prerequisite: 11011106

This course will cover the molecular structure, bonding, reactivities, chemical and physical properties, stereochemistry, preparation and reactions of alkanes, alkenes, alkynes and organohalides functional groups with an emphasis on reaction mechanisms.

05011211 Pharmaceutical Organic Chemistry (2): (3 Cr. Hr.), Prerequisite: 05011210

Provides students with a very important knowledge of the IUPAC naming of the organic compounds, structures, functionality and reactivity of organic molecules. Also the course allows understanding the main reactivity of the functional groups present in biological compounds and drugs and the major synthesis reactions.

05012112 Pharmaceutical Organic Chemistry Lab: (1 Cr.Hr.) Prerequisite: 05011211, Co-request: 05011211

This lab is divided into three parts: The first part contains various separation and purification techniques of organic compounds; including melting point; boiling point, simple, fraction and steam distillation; crystallization and extraction. The second part is organic qualitative analysis including chromatography and chemical tests. The third part deals with the synthesis of certain organic compounds by dehydration, nucleophilic substitution, electrophilic aromatic substitution and hydrolysis.

05011201 Anatomy and Histology: (2 Cr.Hr.), Prerequisite: 11011282

This course aims introducing the students to anatomical terminology surface anatomy, types of tissues and all body systems: integumentary, skeletal, muscular, nervous, circulatory, respiratory, digestive, urinary, reproductive and endocrine systems. This course will integrate human gross and microscopic anatomy with functional morphology.

05011202 Anatomy and Histology Lab: (1Cr.Hr.), Prerequisite: 05011201, Co-request: 05011201

Practical Anatomy and Histology (501212) is a practical course, in which the students are expected to spend three practical hours per week in the lab of Anatomy and Histology. They are going to learn the anatomical terminology and the anatomical planes of the body. They will be also introduced to the anatomy of the human body systems; Skeletal, Muscular, Nervous, Cardiovascular, Digestive, Respiratory and Urogenital systems. Moreover, they will learn the histology of the epithelial and connective tissues.

05011203 Human Physiology (3 Cr. Hr.), Prerequisite: 05011202

This course teaches the human Physiology as a scientific discipline, it's considered the basis of all other medical disciplines. Physiology is the study of how body organs function. It is extremely broad and ranges from the study of the function of individual molecules to exploration of the interactions between multiple organ systems. In this course, you will discover that modern human physiology integrates concepts from a variety of other disciplines including anatomy, pathology, biochemistry and pharmacology

05011213 Pharmaceutical Analytical Chemistry:(3 Cr.Hr.), Prerequisite: 11011106

The course describes principles that are important in analytical chemistry and give the student enough information about how to judge the accuracy and precision of experimental data by application of statistical methods.

05012201 Pathophysiology: (3 Cr. Hr.), Prerequisite: 05011203

This module explains the pathophysiological basis of cellular injury, inflammation, acute and chronic, carcinogenesis and common diseases such as diabetes, heart failure, and asthma. It provides an essential understanding of the mechanism of such diseases. The module will also cover both symptoms and disease progression.

05012114 Pharmaceutical Instrumental Analysis: (3 Cr.Hr.): Prerequisite: 05011213

The main objective of this course is to introduce students to the modern instrumental methods of quantitative and qualitative analysis and to learn about the fundamental principles of operation of these methods, concentration will be drawn basically to spectroscopic and chromatographic methods, their strengths and limitations and their application in pharmaceutical analysis will be discussed. This course will also expose students to statistical data handling and analysis. Finally, the student will have the background needed for method validation and to make reasonable choices among several analytical methods.

05012115 Pharmaceutical Analytical Chemistry & Instrumental Analysis Lab (1 Cr. Hr.): Prerequisite: 05012114, Co-request: 05012114

This lab trains students on methods of instrumental analysis. The lab includes spectral methods of analysis including UV-Visible, atomic absorption spectroscopy (AAS) and flame photometry. The lab also introduces the students to chromatographic techniques such as thin layer chromatography (TLC), High Pressure Liquid Chromatography (HPLC) and Gas Chromatography (GC). These methods are used in lab along with other analytical procedures in applications for analysis of pharmaceutical preparations.

05022111 Physical Pharmacy: (3 Cr.Hr.), Prerequisite: 11021105

This course introduces the thermodynamic science and describe the inter- and intra-molecular interaction and their influence on the state of matter. It differentiates between the different states of matter and define the phase and phase rule. Teaching how to represent the data against time and finding the proper model for the process. The course also focusses on identifying the electrolyte and none electrolyte solutions as well as none colligative properties of a solution and explains the surface and interfacial tension. Factors affecting the solubility and description of the rheological properties of a plastic system is covered.

05022112 Physical Pharmacy Lab: (1 Cr.Hr.), Prerequisite: 05022111, Co-request: 05022111

This course provides the basic concepts of physicochemical principles including states of matter, solubility terms, distribution phenomena, chemical kinetics and their application. Drug diffusion through membranes, the effect of temperature on solubility, factors affecting drug stability and improving drug solubility using different methods. The course also presents the basic

understanding to interfacial phenomena, adsorption concepts, and applications of surface -active agents.

05022211 Pharmaceutical biochemistry: (3 Cr. Hr.), Prerequisite: 05022112, Co-request: 11011105

This three-credit hours' course is mandatory for pharmacy students. The course is to make Biochemistry as clear and interesting as possible and to familiarize the student with the major aspects of biochemistry. It is designed to introduce biochemistry by covering the basic concepts of structures and functions of macromolecules and their building blocks. The aspects of biochemical reactions will be described. Discussion will be given about the metabolism and mechanisms of carbohydrates, lipids, nucleic acids, and proteins, with a detailed information of enzymes regulation and their association to medications. Our focus will be on the human biochemistry of the human body and its relation to the pharmaceutical and medical conditions

05022212 Pharmaceutical Biochemistry Lab: (1 Cr.Hr.), Prerequisite: 05022211, Co-request: 05022211

The purpose of this course is to define biochemistry in a clear and interesting way as possible and to familiarize and show the students of Pharmacy and Medical Technology with the major aspects of biochemistry. This course covers and discusses the vital mechanisms explained and described by biochemistry, the molecular nature of cellular components, and the dynamic aspects of biochemical reactions. Topics included: molecules of life, nucleic acids, proteins, enzymes, carbohydrates and lipids.

05012101 General Microbiology: (3 Cr. Hr.), Prerequisite: 05012201

General microbiology is three credit hours course, designed for pharmacy students. This course presents a review about the history of microbiology and microscopy, providing the students with the basic information regarding the structure and the characteristics of different types of microorganism and their mode of growth. It will introduce the medical, pharmaceutical and environmental importance of microorganisms, focusing on the major bacterial, viral, and some parasitic and fungal diseases infect the human body systems, and illustrate the general properties of the antimicrobial agents and the mode of action.

05022221 Pharmacognosy (3 Cr.Hr.): Prerequisite: 05012115

This course describes the basic information on pharmacognosy and medicinal plants regarding classification and identification of their components. As well as the study of medications derived from natural origin and their pharmacological action. This course will focus on secondary metabolite as active ingredients (volatile oils, resins, terpenoids, cardiac glycosides, saponins, phenolic and related compounds and alkaloids).

05022213 Phytochemistry: (3 Cr.Hr.), Prerequisite: 05022221

This course is intended to chemistry (qualitative and quantitative analysis by chemical and phytochemical methods) of individual compounds or groups of compounds present in products of basic reprocessing of medicinal plants, herbs or plant raw material. In this course will be discuss regarding extraction of active compounds from herbs, their cleaning, isolating, and chemical analyzing (sublimation, distillation, fractional crystallization, chromatography and spectrometry

methods) but also biosynthesis of main primary and secondary metabolites (enzymes, carbohydrates, fats and fatty acids, aromatic compounds, amino acids, peptides and proteins, isoprenoids) and their therapeutic uses.

05022214 Phytochemistry Lab: (1 Cr.Hr.), Prerequisite: 05022213, Co-request: 05022213

This course is designed to provide the student with basic information about practical phytochemistry: extraction, purification and identification of different natural compounds, like: terpenes, flavonoids and alkaloid. Application of thin layer chromatography.

05022215 Pharmaceutics: (3 Cr.Hr.), Prerequisite: 05022112

This course teaches the scientific aspects important in dosage form design and formulation. It provides an understanding of various dosage forms and drug delivery systems. It describes dosage forms applications in addition to formulation considerations. This course will focus on the physicochemical aspects of dosage forms.

05022216 Pharmaceutics Lab: (1 Cr.Hr.), Prerequisite: 05022215, Co-request: 05022215

This course is intended for pharmacy student to learn the steps and line upon which the pre-formulation processing of pharmaceutical dosage form. This course includes general preparation of non-sterile Semisolid and liquid pharmaceutical dosage forms for topical and oral use. Study of dosage forms, advantages and disadvantages, uses, storage and packaging of pharmaceutical products.

05023151 Industrial Pharmacy: (3 Cr.Hr.), Prerequisite: 05022216

This course is intended for pharmacy students to describe the most important pre-formulations studies (physicochemical properties of the drug) for evaluation rationality of formulation a new chemical entity in a dosage form. Identify and classify the different downstream processes (size reduction, mixing, size enlargement and drying) and their mechanisms, demonstrate the applying of the different instruments for different purposes, compare the differences between the different instruments which used for each process, evaluate the flowability of a powder and how to improving this property. It also covers the different types of compaction and the instruments which are used to perform this process. Classifications and evaluation of different excipients which are used in tablet formulation. The course shall describe and explain the different mechanisms for controlling drug release, classify the different coating methods, the instruments which are used for this purpose and the ingredients which are used in this process and their property

05023152 Industrial Pharmacy Lab: (1 Cr. Hr.), Prerequisite: 05023151, Co-request: 05023151

The main objective of this course is to provide the students with the theoretical background and practical experience relating to flow ability of powder, mixing of powder, size reduction & size analysis processes of powders, preparation of effervescent granules. Also to prepare tablets by two methods: direct compression & wet granulation, and to assess the quality control tests of tablets. Students will also perform hard gelatin capsule filling & quality control tests for capsules.

05023111 Medicinal Chemistry (1): (3 Cr. Hr.), Prerequisite: 05022212, Co-request: 05022212

The main objective of the course is to provide students with basics to learn about the various classes of drugs today in therapy, the classification is based as therapeutic groups as well as chemical class of substances. The objective of the first part of the course is the knowledge of the nature of the interactions of drugs and their biological targets, the significance of receptor. Drug metabolism. Knowledge of enzymes which are substrates of drugs considered in the course. The objective of the special part is the knowledge of different classes of drugs acting on the eripheral nervous system (PNS) central nervous system (CNS), and cardiovascular system.

05023211 Medicinal Chemistry (2): (3 Cr. Hr.), Prerequisite: 05023111

This course is a continuation of Medicinal Chemistry 1 and includes a survey of antibiotics, antiviral, nonsteroidal anti-inflammatory, and opioid analgesics, covering structure activity relationship, mechanism of action and other issues related to the pharmacology and clinical use of related agents; in addition to the pharmacokinetic and pharmacodynamics properties of the drugs and the effect of the chemical structure on all these properties.

05023121 Pharmacology (1): (3 Cr.Hr.), Prerequisite: 05012201,05022212

The purpose of this course is to understand therapeutic drug actions and the rationale for using drugs to treat disease. This will be achieved through providing a foundation in the basic principles of pharmacology, neurophysiology and neuroanatomy and synaptic transmission, Drug acting on Autonomic Nervous System. This course will also describe key features of major neurotransmitter systems, including the catecholamines, serotonin, acetylcholine, glutamate and GABA. This course discusses theories and mechanisms of drug addiction and psychopathology. Finally, neurodegenerative disorders, major substances of abuse as well as drugs used to treat mental illness will be addressed.

05023212 Medicinal Chemistry Lab: (1 Cr. Hr.), Prerequisite: 05023211, Co-request: 05023211

This laboratory will evolve the basic knowledge obtained by the students in organic and analytical chemistry of simple organic molecules into active drugs as simple synthesis or multistep. Focus will be made on the assay and purification techniques with regard to the biologically active ingredients. In the molecular modelling part the student will be able to draw and name simple organic molecules on free drawing software as well as carry out simple properties calculations and draw full reactions.

05013211 Pharmaceutical Microbiology (3Cr.Hr.): Prerequisite: 05012101, 05023212

This course aims at teaching the students the concept of sterilization, disinfection, antisepsis and preservation. The different chemical and physical methods used to control microbial contamination, and their mode of action. It also focusses on the methods used for the evaluation of antimicrobial efficacy and factors affecting it, including microbial spoilage, infection risk and contamination control. The principle of the controlled environment (aseptic area and aseptic processing and clean room facilities) will be covered.

05013212 Pharmaceutical Microbiology Lab: (1 Cr.Hr.), Prerequisite: 05013211, Co-request: 05013211

Pharmaceutical Microbiology laboratory is a One-credit- hour course (three contact hours/week). This course is designed for students in pharmaceutical programs. It includes preparing stained smears, culturing microorganisms, studying microbial growth methods, isolation and identification of pathogenic bacteria, and testing their susceptibility to antibiotics

05024111 Immunology and vaccines: (2 Cr. Hr.), Prerequisite: 05013212, Co-request: 05013212

This course is designed to offer essential information of basic immunology including: development of the immune system, innate and acquired immunity, immunoglobulin structure, antigen-antibody reactions, the major histocompatibility complex reactions and antigen presentation, T cell activation and effector functions, cytokines, phagocytic cell function, immune responses to infectious organisms and tumors, autoimmunity, hypersensitivity reactions, and immune deficiencies, immunogenicity and vaccination.

05023221 Pharmacology (2): (3 Cr. Hr.), Prerequisite: 05022221

The purpose of this course is to understand therapeutic drug actions and the rationale for using drugs to treat disease. Systems to be covered in this course include the cardiovascular system, the endocrine system, drugs used in inflammation and analgesics, drugs used in management of respiratory disorders, drug acting on the gastrointestinal tract, and effects of drugs on skin conditions.

05024121 Clinical Biochemistry: (3 Cr.Hr.), Prerequisite: 05022212, 05023221

This three-credit hour course is mandatory for pharmacy students to provide an overview of the key aspects of clinical biochemistry. The purpose of this course is to provide the students with an introduction to the principles of the biochemical analysis of clinical samples and to provide an understanding of how biochemical investigations can be employed in the diagnosis of different diseases. The major clinical chemistry tests for the health care include: electrolytes, proteins, nitrogenous compounds, enzymes, liver function, renal function, lipids, hormones, drugs and nutrition. Case studies are used to highlight and explain the biochemical disorders underlying clinical diseases

05024122 Clinical Biochemistry Lab: (1 Cr.Hr.), Prerequisite: 05024121, Co-request: 05024121

The purpose of this course is to define clinical biochemistry in a clear and interesting way as much as possible and to familiarize the Pharmacy students with the major aspects of clinical biochemistry practice. The course covers and discusses the collection of specimens, the measurement of some main biochemical molecules in human body by defining the principle of the test, describing the procedure, calculating the concentration then finally analyzing and interpreting the obtained results in order to achieve an accurate and clear analysis report.

05024113 Medicinal Chemistry (3): (3 Cr. Hr.), Prerequisite: 05023212

This course is to provide the student with some classes of pharmacodynamics drugs (their structure, chemical names, classifications, synthesis, metabolism, structure activity

relationship, Mechanism of action, uses) In addition, students can demonstrate knowledge upon how to act, attach to the receptor, the biochemical basics of their action and identifying the common pharmacophore of each class.

05024124 Pharmacology (3): (3 Cr. Hr.), Prerequisite: 05023221

The purpose of this course is to study endogenous substances, drugs & chemicals that have actions significant for the health & well-being of man; drugs used in chemotherapy of infection & cancer, and to describe characteristics of major antimicrobial and anticancer medications, which should enable student to deal with different classes of drugs used in treatment of most diseases. Also should be able to Understand concepts of pharmacodynamic processes that are associated with drug action on various body systems and pharmacokinetics processes that are associated with drug administration, distribution, metabolism and excretion

05023101 Biostatistics: (2 Cr. Hr.), Prerequisite: 11031101

This course will provide a basic overview of fundamental statistical and pharmaceutical medical statistical principles and represents an introduction for undergraduate students to the field and provides knowledge for kind of statistical studies and their graphical presentation, tools for describing central tendency and dispersion of data; basic probability theory; statistical hypothesis testing and its application to group comparisons; methods of sampling and various statistical measures. At the conclusion of the course, students should be able to effectively communicate with statisticians and better understand statistical material in reports and journals.

05024211 Biopharmaceutics & Pharmacokinetics: (3 Cr.Hr.), Prerequisite: 05023152, 05023121

This course aims at providing students with the basic biopharmaceutics and pharmacokinetic principles that include terminology, models, equations and factors affecting drug absorption, distribution, metabolism and excretion and its importance in drug therapeutic effect. Students will develop and demonstrate knowledge and understanding physiological factors and factors related to physiochemical properties of the drug affecting bioavailability in addition to factors related to the dosage forms. The student is also introduced to various drug administration routes with particular emphasis on understanding the transport of a drug and how this is affected by their physicochemical properties and the physiological barriers in the human body. Further, solved examples obtained from textbook during lectures as well as during kinetic labs are used to illustrate the application of pharmacokinetic principles and equations, making them realistic for clinical practice.

05024212 Biopharmaceutics & Pharmacokinetics Lab: (1 Cr.Hr.), Prerequisite: 05024211, Co-request: 05024211

This course aims at providing students with the basic biopharmaceutics and pharmacokinetic principles that include terminology, models, equations and factors affecting drug absorption, distribution, metabolism and excretion and its importance in drug therapeutic effect. Students will develop and demonstrate knowledge and understanding physiological factors and factors related to physiochemical properties of the drug affecting bioavailability in addition to factors related to the dosage forms. The student is also introduced to various drug administration routes with particular emphasis on understanding the transport of a drug and how this is affected by

their physicochemical properties and the physiological barriers in the human body. Further, solved examples obtained from textbook during lectures as well as during kinetic labs are used to illustrate the application of pharmacokinetic principles and equations, making them realistic for clinical practice.

05023122 Over the counter medications: (3 Cr. Hr.), Prerequisite: 05023221

The Over the Counter Medications (OTC) course introduces students to the medications and pharmaceutical products that are supplied from the pharmacy without the need of a doctor's prescription. The pharmacist role in self-care and all they need to know about patient education and counselling.

05024251 Drug Design: (3 Cr.Hr.), Prerequisite: 05024123

This course provides very important basics of the design, development, and discovery of new pharmaceutical agents based on the available information related to their structural activity relationships (SAR), physicochemical characteristics, pharmacokinetic and pharmacodynamics properties. The course also describes in detail the bioisosteric modifications of lead compounds and their role in designing and developing new drugs. Furthermore, the subject covers the drug-receptor interactions and enzyme inhibitors, and illustrates how the molecular modelling and Computer-Aided Drug Design (CADD) are applied in drug discovery

05024221 Toxicology: (2 Cr. Hr.), Prerequisite: 05024124

Upon successful completion of this course, the students must be able to accurately identify the most prevalent clinical cases of toxicity taking into consideration causative agents, time and duration of exposure. This course thoroughly explains dose-response relationships, disposition and metabolism, toxic responses to foreign compounds, and presents detailed examples to make the mechanisms of toxicity more accessible to students encountering the subject for the first time.

05024222 Pharmacology and Toxicology Lab: (1Cr.Hr.), Prerequisite: 05024221, Co-request: 05024221

This course teaches the scientific aspects important in pharmacological Qualitative and Quantitative experiments. It provides an understanding of mechanism of toxicity, toxicokinetics, clinical presentation, diagnosis and medications indicated and contraindicated in the treatment of toxicity of common drug and chemical groups.

05025151 Pharmaceutical biotechnology: (3 Cr. Hr.), Prerequisite: 05013212, 05024122

This course covers the important aspects of pharmaceutical biotechnology as a modern science, including: fermentation technology and industrial production of different pharmaceutical products. Recombinant DNA technology and other specific molecular techniques that involved in genetic engineering and gene therapy. The production of specific pharmaceutical products including human insulin, monoclonal antibodies, vaccines and others. The economic consideration for biopharmaceutical production.

05025121 Clinical pharmacy and therapeutics (1): (3 Cr. Hr.), Prerequisite: 05024123

This course gives the pharmacist who has to provide patient pharmaceutical care or to supply drug information to other health care professionals a good understanding of the pathophysiology

and therapeutic interventions necessary for cure and palliation. Therefore, the course describes common disease states, diagnosis, prognosis, therapeutic objectives with emphasis on pharmaceutical care management. The role of a pharmacist in the provision of optimal patient care (including patient counseling) through monitoring of patient's drug therapy is emphasized. Areas covered include; the therapy of cardiovascular system and some parts of the endocrine system.

05025221 Clinical pharmacy and therapeutics (2): (3 Cr.Hr.), Prerequisite: 05025121

This course gives the pharmacist who has to provide patient pharmaceutical care or to supply drug information to other health care professionals a good understanding of the pathophysiology and therapeutic interventions necessary for cure and palliation. Therefore, the course describes common disease states, diagnosis, prognosis, therapeutic objectives with emphasis on pharmaceutical care management. The role of a pharmacist in the provision of optimal patient care through monitoring of patient's drug therapy is emphasized. Areas covered include; selected respiratory, renal, infectious, and musculoskeletal diseases.

05025132 Case studies in therapeutics: (1 Cr.Hr.), Prerequisite: 05025121, Co-request: 05025121

This course will provide a basic overview of selected diseases; hypertension, heart failure, deep venous thrombosis and diabetes mellitus. Clinical manifestations, treatment options, pharmacological and non-pharmacological treatment for a selected patient and patient education about disease and medications will be covered.

05025231 Pharmaceutical Legislations & Ethics: (1 Cr. Hr.), Prerequisite: 05023221

This course covers the laws of the Syndicate of Pharmacists of Jordan, which includes the Pharmacists Syndicate Law (Law No. 51 of 1972) as well as the Drug and Pharmacy Law No. 12 of 2013. The course also covers the regulations of the Pharmacy Syndicate such as the retirement system, social security and the pharmaceutical licensing system in force in Jordan. Some of the instructions of the Takaful Fund, the health insurance and the regulation of the medical system, the specifications of the general pharmacy departments and the technical and health equipment for the licensing of the drug store is covered.

05025242 Pharmacy Practice Lab: (1 Cr. Hr.), Prerequisite: 05025221, Co-request: 05025221

This course introduces you to your professional responsibilities of patient-centered pharmaceutical care in the community sector. The course will cover various topics on pharmacy practice, communication skills, the role of pharmacist as drug expert in interviewing and counseling the patient on the use of their medications. The course is divided into three parts; the workshops, a practical 30 hours community pharmacy training and patient counseling with brochures (medical material).

05023251 Cosmetics: (2Cr. Hr.), Prerequisite: 05023152

This course provides students with an introduction to the knowledge of cosmetics products. It will provide the students with in-depth knowledge of skin, mechanistic analysis of the relevant

skin functions, percutaneous absorption and rationale for dermatologic formulations, as well as their evaluation and relevant tests. The courses cover all types of skin disorders and skin care products, including anti-aging, whitening agents in addition color make-up preparations. It will cover structure and functions of hair, hair damage, alopecia and their management

05025233 Pharmacoeconomics: (3 Cr.Hr.), Prerequisite: 05024123

The Pharmacoeconomics course provides students with an introduction to the principles and tools of pharmacoeconomics and health outcomes assessment that are commonly used to study the cost impact of pharmaceutical products/services and interventions on healthcare systems and patients outcomes. It aims to help the students to understand the basic concepts of pharmacoeconomics and its application in informing the decision making process in the healthcare sector and resource allocation.

- Elective Section Requirements: -

05023161 Pharmaceutical principles & medicinal terminology: (3 Cr.Hr.)

The aim of this course is to provide pharmacy students sufficient basis in medical terminology so that the student is able to understand most of the medical terms encountered in practice. To do that the course approaches terminologies through a study of the part of words (the prefixes roots and suffixes) that create the meanings attributed to the total term. In line with that all pharmacy related principles will be covered including verification, ordering and dispensing ...etc.

05023261 Drug Information: (3 Cr.Hr.), Prerequisite:05024123

This course is intended to provide a comprehensive over view for the pharmacy students to provide a drug information service in their future place of work providing information to optimize drug use, and to develop a systematic approach in answering enquiries. It is intended to provide knowledge which aims to a) enhance the image and credibility of the profession, and b) ensure that information of the highest standard is provided to healthcare

05025261 Special topics in pharmacy 1: (1 Cr.Hr.), Prerequisite: Graduate Semester

This course is intended to provide the students with an overview of research. It entails enabling students to practice literature review and write an abstract and small project of selected topic. Delivered projects will be assessed individually with feedback to students.

05023263 Pharmacoinformatics: (3 Cr.Hr.), Prerequisite: 05024123

This course is intended to develop an understanding of drug informatics, its goals, standards, applications, and uses in demanding clinical environment. This course will enable student to identify and solve drug informatics problems in the best possible ways.

05025262 Special topics in pharmacy 2: (2 Cr.Hr.), Prerequisite: Graduate Semester

This course is intended to provide the students with an in-depth review of research. It entails enabling students to practice literature review and write an extensive project or conduct a small study in collaboration with faculty members. Delivered projects will be assessed individually using peer review process from a committee with immediate feedback to students.

05023264 Pharmaceutical Quality Assurance and Quality Control: (3 Cr.Hr.), Prerequisite:05023152

This course is intended to provide the students with the principles of quality management, quality assurance, and quality control. The focus in this course will be on regulatory requirements pertaining to pharmacy including Good manufacturing Practice and Quality by Design (QbD). Quality control of different dosage forms in the drug industry will be discussed. The course will cover quality aspects in design, manufacture, and final product validation.

05024161 Communication skills in pharmacy: (3 Cr.Hr.), Prerequisite:05023153

This course is designed to teach strategies pharmacists can use to improve communication with patients and other health care providers. Health care is currently undergoing a shift to more patient centered models of care whereby patients are actively involved in making decisions about treatments, in setting goals for A treatment, and in monitoring outcomes of care. In order for pharmacists to participate in more patient-centered care, they must strengthen their interpersonal communication skills.

05025263 Research Paper & Seminar :(3 Cr. Hr.), Prerequisite: Graduate Semester

The purpose of the Research Project and Seminar is training on the methodology of scientific research to identify the subject, the collection of scientific material and help the students refine their skills of research, searching scholarly information and presenting their work. Students also improve their understanding of study design, which includes defining the hypothesis, providing a rationale for it. As such, students then write term papers to showcase and review the results obtained during the research.

05023262 Pharmaceutical Dosage Forms: (3 Cr. Hr.), Prerequisite: 05023152

This course aims at providing students with the knowledge of advanced pharmaceutical dosage forms. It will provide the students with in-depth studies of sustained, controlled, modified and targeted release formulations, their formulation concept and challenges encountered in developing it. The course will cover recent challenges in formulation development and the evolution of new technologies to solve the problems (e.g., solubility and stability issues, and delivering of large molecules). The course will highlight liposome, biotechnology and gene therapy use and applications. The course also provides an appreciation of routes of administration and their implications in successful drug therapy.

05023265 Therapeutic Drug Monitoring (TDM): (3Cr.Hr.), Prerequisite: 05024123

This course specifically, is a practice applied to a small group of drugs in which there is a direct relationship between serum drug concentration and pharmacological response, as well as, a narrow therapeutic range, on the basis of their knowledge of pharmacology and clinical pharmacokinetics. The objective of this course is to enable the student to use serum drug concentration, and pharmacokinetics and pharmacodynamics to individualize and optimize

patient responses to drug therapy by maintaining serum drug concentration within the therapeutic range above which induced toxicity.

05024162 Advanced pharmacology: (3 Cr.Hr.), Prerequisite: 05024123

This course deals with developing the student understanding of receptor pharmacology and pharmacological techniques and concepts. The primary aim of this course is to enhance the student understanding of the molecular basis of pharmacology. It should illustrate how genes can influence our physiology and hence our pharmacological response to drugs used to treat pathological conditions.

05024163 Pharmacovigilance: (3 Cr. Hr.), Prerequisite: 05025221

The Overview of Pharmacovigilance course gives a good understanding of the basic principles of pharmacovigilance, the course covers the history of pharmacovigilance and drug safety, key components within adverse event reporting and an overview of signal detection and risk management.

05024261 Medical Parasites: (1 Cr. Hr.), Prerequisite: 05013212

This course is designed to discuss the life cycle, symptoms, pathology, pathogenesis diagnosis and antiparasitic drugs of medically important parasites.

05023162 Public Health: (3 Cr. Hr.), Prerequisite: 05024123

The purpose of this semester course is to introduce students to the basic principles of public health with an emphasis on health promotion and disease prevention with an emphasis on the role of pharmacists in public health. Students will learn area of epidemiology, determinants of health, and how the epidemiology of diseases differs based on race, gender, and geography. Also provide students with some basic life support (First Aid) principles that will help students to deal with emergency cases outside hospital, and to provide initial care to the victim of injury or sudden illness until more advance care is provided.

05023163 Applied Pharmacognosy (3 Cr.Hr.): Prerequisite: 05022214

This course focused on the study of evaluation of crude drugs, their sources and quality control. Study of preparation of crude drugs. Factors affecting drug production, tissue culture, structure elucidation of natural products and herbal medicine and food therapy.

05024262 Pharmaceutical healthcare (2 Cr. Hr.): Prerequisite: 05025221

This course aims to identify and discuss several topics related to healthcare. This covers the role of pharmacist in primary, secondary, and tertiary healthcare in addition to pharmacist's role as a member of the healthcare team next to the nurse and physician. In addition, it discusses the role of pharmacists in patient education and counseling. This course also aims to reinforce the important role of the pharmacist as a liaison between the physician and the patient.

05024263 Hospital Pharmacy: (3 Cr. Hr.): Prerequisite: 05025221

This course aims to identify and discuss several regulations, guidelines, terminologies and protocols used/applied in hospitals among the different healthcare providers and pharmacists in particular. It will explore the organization of Hospital Pharmacy, identify the role of the pharmacist and other personnel, medicine resources management, formulary management and

medication safety. In addition, this course will discuss several medications related issues such as prescription management, pharmaceutical calculations, parenteral nutrition, drug information and its resources.

05025161 Pharmaceutical marketing: (3 Cr. Hr.), Prerequisite: 05025233

The Pharmaceutical Marketing course aims to provide comprehensive marketing overview in terms of concepts and techniques to students who are entering employment in any capacity within the field of pharmacy. This involves fostering the acquisition of knowledge and skills required to excel in the areas of added value services, pharmaceutical marketing including distribution, promotion, pricing and production. Emphasis is placed on the use of active learning strategies rather than passive listening and regurgitation of information. This is to ensure that the students have adequate opportunity to elaborate and learn the information and skills that are presented. One of the strategies to accomplish this will be group discussion with some role models in the field of pharmaceutical marketing in Jordan.

