



Jordan University of Science and Technology
Faculty of Pharmacy

Study Plan of Bachelor Degree in Pharmacy

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Vision:

Achieving excellence in Pharmaceutical education and Pharmaceutical care.

Mission:

Educating highly qualified Pharmacists that are equipped with efficient skills in their future careers.

Participating in the development of national programs of Pharmaceutical care and Pharmacy practice.

Providing the Jordanian community with high quality Pharmaceutical education, scientific research and Pharmaceutical services.

Objectives:

1. To provide students with the comprehensive scientific knowledge and skills needed for future Pharmacists in different aspects of Pharmaceutical sciences.
2. To provide students with high quality practical training in order to develop the students' skills in the field of Pharmacy practice.
3. To provide the students with special professional knowledge and ethics needed for the profession of Pharmacy.
4. Graduating students with significant Pharmaceutical skills and knowledge needed for the different career tracks available in the Pharmacy fields.

Job Opportunities:

1. Community and hospital Pharmacies.
2. Pharmaceutical marketing/Science liaisons.
3. Pharmaceutical Industry.
4. Food and Drug administration.
5. Academia.
6. Pharmaceutical research and development.
7. Medical websites.
8. International and national health organizations.

Study Plan of Bachelor degree in Pharmacy

Numbering and coding system of courses of the study plan.

Course Coding

The following codes are used to designate courses:

Faculty	Level/year	Field	Sequence
PHAR	x	y	z

Course Numbering

- The Pharmacy courses are tabled and numbered in such a manner to recognize each course regarding its subject area, year or level, and semester offered.
- Ex. PHAR xyz: The **PHAR** symbol in the course number denotes Pharmacy and (xyz) is a 3-digits number:

A. The first digit denotes the year level of the course according to student's study plan as follows:

Code	Level/year
1	First
2	Second
3	Third
4	Fourth
5	Fifth

B. The second digit denotes the course field subject as follows:

Number	Specialization
0	Introductory and Basic Pharmaceutical sciences
1	Clinical Pharmacy
2	Medicinal Chemistry and Pharmacognosy
3	Medicinal Chemistry and Pharmacognosy
4	Clinical Pharmacy
5	Pharmaceutical Technology
6	Clinical Pharmacy
7	Pharmaceutical Technology
8	Clinical Pharmacy
9	Clinical Pharmacy

C. The third digit denotes sequence of semester during which the course is offered according to the study plan. In way that odd numbers are given to the first and summer semesters while even numbers are given to second semesters.

Example: PHAR 446 Therapeutics 1 means:

PHAR	4	4	6
PHARMACY	Level (Fourth year)	Field (Clinical Pharmacy)	Sequence (Second semester)

A Bachelor of Science (B.Sc.) degree in Pharmacy at JUST is awarded in accordance with the statute stated by JUST regulations for B.Sc. awarding issued by the Dean's Council based on the adjusted 1987 law for awarding scientific degrees and certifications at JUST after completing (165) credit hours successfully.

The study plan composed of the following:

Classification	Credit hours		
	Compulsory	Elective	Total
University requirement	16	9	25
Faculty requirement	90	9	99
Specialty requirement	41	-	41
Total	147	18	165

A. University Requirements (25 Credit Hours)

1. Compulsory University Requirements: (16 Credit Hours)

Course No.	Course title	Credit hours	Theoretical	Practical
ARB 101	Arabic Language	3	3	-
CIS 100 ⁽¹⁾	Computer Skills	3	2	1
ENG 111 ⁽²⁾	English Language 1	3	3	-
ENG 112 ⁽³⁾	English Language 2	3	3	-
HSS 100	Culture and University Behavior	1	1	-
MS 100 ⁽⁴⁾	Military sciences	3	3	-

Notice: All non-Arabic speaking international students in the University are required to study one course in Arabic language as a substitute for ARB 101 shown below:

Course No.	Course title	Credit hours	Theoretical	Practical
ARB 101A	Fundamentals of Arabic Language (for non-Arabic speaking students) as a substitute for the course ARB101 Arabic language)	3	3	-

- (1) This course is required from Jordanian students only; graded on Pass/Fail basis. Students graduating from Royal Military faculty and military candidate's school and equivalent institutes are exempted from taking this course. Non-Jordanian Arabic speaking students are required to take a substitute for this course from the elective courses and in this case the grade of this course is included in their grade point average (GPA).
- (2) A student who passes the Computer Skills Placement Test with a grade > 50% is exempted from CIS 100. Students who hold (Computer Driving License the Cambridge Diploma Certificate in Information and Technology are exempted from studying this course).
- (3) Pre-requisite: passing Eng 099 or passing English Language Placement Test with a grade > 50%.
- (4) Pre-requisite: Eng 111 or passing the English Language Placement Test with a grade > 80%. Students who have a TOEFL score of > 500 are exempted from both Eng 099 and Eng. 111.

2. Elective courses: (9 credit hours) selected from the following courses:

Course No.	Course title	Credit hours	Theoretical	Lab
NU100	Health Promotion	3	3	-
NF177	Food Preservation (In English Language)	3	3	-
AP200	Farm Animal Products and Production	3	3	-
ADS100	Dental and Oral Health (not for Dental and Allied Dental Sciences)	3	3	-
PHAR104	Drugs and Medicinal Plants in Jordan (not for Environment students)	3	3	-
PH104	Community Health and Nutrition	3	3	-
PH200	First Aid	3	3	-
VM211	Animal Health (not for Veterinary Medical and Agriculture students)	3	3	-
VM212	Pet Animal Care	3	3	-
VM213	Animal Behavior and care	3	3	-
ARB200	Appreciation of Literary Texts	3	3	-
HSS105	French Language	3	3	-
HSS106	German Language	3	3	-
HSS115	Islam and Contemporary Issues	3	3	-
HSS116	Islamic Economic System	3	3	-
HSS121	Principles of Sociology	3	3	-
HSS126	Principles of Psychology	3	3	-
HSS127	Educational Technology	3	3	-
HSS128	National Education	3	3	-

HSS131	Islamic Civilization	3	3	-
HSS132	The History of the City of Jerusalem	3	3	-
HSS133	Civilization and Contemporary Cultures	3	3	-
HSS135	Islamic Culture	3	3	-
HSS137	Human Rights	3	3	-
HSS141	Introduction to Economics (not for Information Technology Systems students)	3	3	-
HSS142	Library, Information and Research	3	3	-
HSS151	Introduction to Administration (not for Information Technology Systems students)	3	3	-
HSS161	Contemporary Problems	3	3	-
HSS166	Human and Science	3	3	-
HSS211	Sociology (In English language)	3	3	-
HSS212	Arab Society (In English language)	3	3	-
HSS213	Individual and Society (in English language)	3	3	-
HSS216	International global System (In English language)	3	3	-
HSS221	Introduction to Psychology (In English Language)	3	3	-
HSS222	Creativity and Problem solving	3	3	-
HSS224	Leadership and Communication Skills	3	3	-
HSS231	The History of Science for Islam	3	3	-
HSS250	The History of Music (In English Language)	3	3	-
HSS 242	Information and Research (in English language)	3	3	-

HSS250	The History of Music (in English language)	3	3	-
HSS429	Behavior Management in Children	3	3	-
ES103	Environment Protection (not for Environment students)	3	3	-
PT100	Wellness and Lifestyle (not for Physical and Occupational Therapy)	3	3	-
CHE191	Introduction to Nanotechnology	3	3	-
NR200	Natural Resources and Man (not for Agriculture students)	3	3	-
NR 207	Plant Earth Problems & Solutions (not for Agriculture students)	3	3	-
ME102	Introduction to Renewable Energy (not for mechanical engineering students)	3	3	-
ME211	Introduction to Automobile Mechanics (not for mechanical engineering students)	3	3	-
PP200	Home Gardens (not for Agriculture students)	3	3	-
PP201	Bees Keeping (not for Agriculture students)	3	3	-
PP202	Jordan's Natural Plants (not for Agriculture students)	3	3	-

B. Faculty Requirements: (99 credit hours) distributed as follows:**1. Mandatory courses (90 credit hours)**

Course No.	Course title	Credit hours	Theoretical	Lab	Prerequisite or co-request
BIO103	General Biology	3	3	-	-
BIO107	General Biology Practical	1	-	1	BIO103 or Co-requisite
MATH102A	Calculus 2 (for biological sciences students)	3	3	-	-
PHY103	General Physics	3	3	-	-
CHEM103	General Chemistry	3	3	-	-
CHEM107	General Chemistry Lab	1	-	1	CHEM103 or Co-requisite
CHEM217	Organic Chemistry	3	3	-	CHEM103
CHEM218	Organic Chemistry Laboratory	1	-	1	CHEM217 or Co-requisite
CHEM262	Biochemistry	3	3	-	CHEM217
MED210	Anatomy and Histology	3	2	-	BIO103
MED210	Anatomy and Histology Practical	-	-	0	Co-requisite
MED230	Human Physiology	3	3	-	BIO103
MED372	Pathophysiology for pharmacy students	3	3	-	MED230
PH311	Biostatistics	2	2	-	MATH102A
PHAR222	Pharmaceutical Organic Chemistry	3	3	-	CHEM217
PHAR225	Pharmaceutical Analytical Chemistry	3	3	-	CHEM013
PHAR321	Medicinal Chemistry 1	3	3	-	PHAR222
PHAR322	Medicinal Chemistry 2	3	3	-	PHAR321
PHAR323	Pharmaceutical Instrumental Analysis	3	3	-	CHEM233
PHAR329	Pharmaceutical Analytical chemistry & Instrumental Analysis lab	1	-	1	PHARM323 or Co-requisite
PHAR341	Pharmacology 1	3	3	-	MED372
PHAR342	Pharmacology 2	3	3	-	PHAR341
PHAR351	Pharmaceutics 1	3	3	-	PHAR222

PHAR353	Pharmacy Practice Laboratory 1	1	-	1	PHAR351 or Co-requisite
PHAR354	Pharmaceutics 2	3	3	-	PHAR 351
PHAR356	Pharmacy Practice Laboratory 2	3	-	1	PHAR 354 or Co-requisite
PHAR361	Clinical Biochemistry	3	3	-	MED372
PHAR366	Drug Information	1	1	-	PHAR341
PHAR421	Medicinal Chemistry 3	3	3	-	PHAR322
PHAR441	Pharmacology 3	3	3	-	PHAR342
PHAR451	Pharmaceutics 3	3	3	-	PHAR354
PHAR453	Pharmaceutical Microbiology	3	3	-	MED372
PHAR454	Pharmacy Practice Laboratory 3	1	-	1	PHAR451 or Co-requisite
PHAR456	Biopharmaceutics and Pharmacokinetics	3	3	-	PHAR451
PHAR460	Pharmaceutical Biotechnology	3	3	-	PHAR453
PHAR461	Immunology and Vaccines	2	2	-	MED372
PHAR464	Pharmaceutical Microbiology and Biotechnology Lab	1	-	1	PHAR460 or Co-requisite
PHAR462	Clinical Nutrition	2	2	-	PHAR361
Total		90	81	8	

2. Elective courses: Students have to choose courses equivalent to (9) credit hours from the faculty of Pharmacy elective courses as follows:

Course No.	Course title	Credit hours	Theoretical	Lab	Prerequisite (or Co)
PHAR504	Selected Topics 1	1	1	-	Dean's approval
PHAR505	Selected Topics 2	2	2	-	Dean's approval
PHAR521	Advanced Medicinal Chemistry	3	3	-	PHAR421
PHAR522	Drug Design	3	3	-	PHAR421
PHAR523	Nuclear Pharmacy	3	3	-	PHAR421
PHAR524	Radiation Technology	3	3	-	PHAR421
PHAR525	Advanced Chemistry of Natural Products	3	3	-	PHAR421
PHAR526	Quality Control	3	3	-	PHAR451
PHAR527	Toxic Plants	3	3	-	PHAR421
PHAR528	Alternative Medicine	3	3	-	PHAR433
PHAR554	Advanced Pharmaceutical Technology	3	3	-	PHAR451
PHAR 556	Advanced Industrial Pharmacy	3	3	-	PHAR451
PHAR558	Pharmaceutical Regulatory Affairs	3	3	-	PHAR451
PHAR559	Drug Stability	3	3	-	PHAR451
PHAR571	Advanced Pharmaceutical Biotechnology	3	3	-	PHAR460
PHAR573	Advanced Pharmaceutical Microbiology	3	3	-	PHAR460
PHAR574	Gene & Protein Therapy	3	3	-	PHAR460
PHAR575	Advanced Natural Pharmacy	3	3	-	PHAR451
PHAR576	Cosmetic preparations	3	3	-	PHAR451
PHAR577	History of Pharmacy and Therapy	3	3	-	PHAR451
PHAR578	Drug registration & Approval	3	3	-	PHAR451
PHAR579	Communication skills in Pharmacy	3	3	-	PHAR446
PHAR580	Pharmaceutical Intellectual Property	3	3	-	PHAR451
PHAR585	Pharmacy Management	3	3	-	PHAR466

PHAR586	Pharmacoepidemiology	3	3	-	PHAR466
PHAR590	Advanced Pharmacology	3	3	-	PHAR 441
PHAR591	Advanced Pharmacy Practice	3	3	-	PHAR466
PHAR592	Advanced Therapeutics (for Pharmacy students)	3	3	-	PHAR446
PHAR 593	Molecular Pharmacology	3	3	-	PHAR 441
PHAR594	Clinical Examination	3	3	-	PHAR446
PHAR595	Pharmacogenetics	3	3	-	PHAR441
PHAR596	Hospital Pharmacy	3	3	-	PHAR401
PHAR597	Clinical Pharmacology	3	3	-	PHAR441

C. Program requirements (Pharmacy): (41) credit hours allocated from the faculty of Pharmacy as follows:

Course No.	Course title	Credit hours	Theoretical	Lab	Prerequisite (or Co)
PHAR226	Heterocyclic Chemistry	2	2	-	PHAR222
PHAR334	Pharmacognosy and Phytochemistry	3	3	-	PHAR222
PHAR336	Pharmacognosy and Phytochemistry Lab.	1	-	1	PHAR334 or Co-requisite
PHAR401	Community Pharmacy*	3	-	3	Passing 130 credit hours
PHAR433	Phytotherapy	3	3	-	PHAR334
PHAR446	Therapeutics 1	3	3	-	PHAR342
PHAR458	Pharmaceutical Technology	3	3	-	PHAR451
PHAR466	Pharmacy Ethics and Law	2	2	-	PHAR362
PHAR547	Therapeutics 2	3	3	-	PHAR446
PHAR549	Clinical Cases	1	-	1	PHAR547 or Co-requisite
PHAR555	Drug Delivery	3	3	-	PHAR451
PHAR560	Therapeutics 3	3	3	-	PHAR547
PHAR565	Pharmaceutical Marketing	2	2	-	PHAR547
PHAR567	Toxicology	2	2	-	PHAR441
PHAR569	Pharmacy Practice	3	3	-	PHAR466

PHAR570	Pharmacoeconomics	2	2	-	PHAR547
PHAR572	Over-the-Counter Medicines	2	2	-	PHAR547
TOTAL		41	36	5	

* Students are trained for 8 consecutive weeks in a registered community pharmacy inside Jordan. Students are not allowed to have training outside Jordan. Students are not allowed, under any circumstances, to register for courses along with the training. Students are eligible for this training only after passing 130 credit hours.

Study Plan

FIRST YEAR											
First semester						Second semester					
Course No.	Course name	Total credits	Weekly hours		Prerequisite/ Co-requisite	Course No.	Course name	Total credits	Weekly hours		Prerequisite/ Co-requisite
			Lecture	Lab					Lecture	Lab	
CHEM 103	General Chemistry	3	3	-	--	ENG 112	English language 2	3	3	-	ENG 111*
CHEM 107	General Chemistry lab	1	-	2	CHEM 103 (or Co)	PHY 103	General physics	3	3	-	--
ARB 101	Arabic Language	3	3	-	--	BIO 103	General biology	3	3	-	--
MATH 102A	Calculus 2 (for Biological sciences students)	3	3	-	--	BIO 107	General biology practical	1	-	2	BIO 103 (or Co)
CIS 100	Computer Skills	3	2	1	--	MS 100	Military sciences	3	3	-	--
ENG 111	English Language 1	3	3	-	Passing ENG 099	CHEM 217	Organic Chemistry	3	3	-	CHEM103
				-	--	CHEM 218	Organic Chemistry Lab	1	-	3	217CHEM (or Co)
Total		16	14	3		Total		17	15	5	

* Or scoring 80% or more in the English Language Level Exam

SECOND YEAR											
First semester						Second semester					
Course No.	Course name	Total credits	Weekly hours		Prerequisite/ Co-requisite	Course No.	Course name	Total credits	Weekly hours		Prerequisite/ Co-requisite
			Lecture	Lab					Lecture	Lab	
MED 210	Anatomy and Histology	3	2	-	BIO 103	PHAR 225	Pharmaceutical Analytical Chemistry	3	3	-	CHEM 103
MED 210	Anatomy and Histology (Practical)	0	-	2	Co/With MED 210	PHAR 226	Heterocyclic Chemistry	2	2	-	PHAR 222
MED 230	Human Physiology	3	3	-	BIO 103	PH 311	Biostatistics	2	2	-	MATH 102A
PHAR 222	Pharmaceutical Organic Chemistry	3	3	-	CHEM 217	CHEM 262	Biochemistry	3	3	-	CHEM 217
HSS 100	Culture and University Behavior	1	1	-	--	MED 372	Pathophysiology (For Pharmacy students)	3	3	-	MED 230
	University Elective	3	3	-	--		University Elective	3	3	-	--
	University Elective	3	3	-	--						
Total		16	16	2		Total		16	16	0	

THIRD YEAR											
First semester						Second semester					
Course No.	Course name	Total credits	Weekly hours		Prerequisite/ Co-requisite	Course No.	Course name	Total credits	Weekly hours		Prerequisite/ Co-requisite
			Lecture	Lab					Lecture	Lab	
PHAR 321	Medicinal Chemistry 1	3	3	-	PHAR 222	PHAR 322	Medicinal Chemistry 2	3	3	-	PHAR 321
PHAR 323	Pharmaceutical Instrumental Analysis	3	3	-	PHAR222 PHAR225	PHAR 334	Pharmacognosy and Phytochemistry	3	3	-	PHAR 222
PHAR 329	Pharmaceutical Analytical Chemistry and Instrumental Analysis Lab	1	-	2	PHAR 323 (or Co)	PHAR 336	Pharmacognosy and Phytochemistry lab	1	-	3	PHAR 334 (or Co)
PHAR 361	Clinical Biochemistry	3	3	-	MED 372	PHAR 342	Pharmacology 2	3	3	-	PHAR 341
PHAR 341	Pharmacology 1	3	3	-	MED 372	PHAR 354	Pharmaceutics 2	3	3	-	PHAR 351
PHAR 351	Pharmaceutics 1	3	3	-	PHAR 222	PHAR 356	Pharmacy practice lab 2	1	-	2	PHAR 354 (or Co)
PHAR 353	Pharmacy practice lab 1	1	-	2	PHAR 351 (or Co)	PHAR 366	Drug Information	1	1	-	PHAR 341
Total		17	15	4		Total		15	13	4	

FOURTH YEAR											
First semester						Second semester					
Course No.	Course name	Total credits	Weekly hours		Prerequisite/ Co-requisite	Course No.	Course name	Total credits	Weekly hours		Prerequisite/ Co-requisite
			Lecture	Lab					Lecture	Lab	
PHAR 421	Medicinal Chemistry 3	3	3	-	PHAR 322	PHAR 446	Therapeutics 1	3	3	-	PHAR 342
PHAR 433	Phytotherapy	3	3	-	PHAR 334	PHAR 454	Pharmacy practice lab 3	1	-	2	PHAR 451 (or Co)
PHAR 441	Pharmacology 3	3	3	-	PHAR 342	PHAR 458	Pharmaceutical Technology	3	3	-	PHAR 451
PHAR 451	Pharmaceutics 3	3	3	-	PHAR 354	PHAR 456	Biopharmaceutics and Pharmacokinetics	3	3	-	PHAR 451
PHAR 453	Pharmaceutical Microbiology	3	3	-	MED 372	PHAR 460	Pharmaceutical Biotechnology	3	3	-	PHAR 453
PHAR 461	Immunology and Vaccines	2	2	-	MED 372	PHAR 464	Pharmaceutical Microbiology and Biotechnology lab	1	-	2	PHAR 460 (or Co)
						PHAR 466	Pharmacy Ethics and Law	2	2	-	PHAR 441
Total		17	17	0		Total		16	14	4	

Summer semester				
Course No.	Course Name	Credit Hours	Weeks	Pre-requisite
PHAR401	Community Pharmacy*	3	8	Passing 120 credit hours
Total		3	8	

*Students are trained for 8 consecutive weeks in a registered community pharmacy inside Jordan. Students are not allowed to have training outside Jordan. Students are not allowed, under any circumstances, to register for courses along with the training except graduating students whom may register a course or a seminar or both along the training course. Students are eligible for this training only passing 130 credit hours.

FIFTH YEAR											
First semester						Second semester					
Course No.	Course name	Total credits	Weekly hours		Prerequisite/ Co-requisite	Course No.	Course name	Total credits	Weekly hours		Prerequisite/ Co-requisite
			Lecture	Lab					Lecture	Lab	
PHAR 555	Drug delivery	3	3	-	PHAR 451	PHAR 560	Therapeutics 3	3	3	-	PHAR 547
PHAR 547	Therapeutics 2	3	3	-	PHAR 446	PHAR 562	Clinical Nutrition	2	2	-	PHAR 361
PHAR 549	Clinical Cases	1	-	2	PHAR 547 (or Co)	PHAR 569	Pharmacy practice	3	3	-	PHAR 466
PHAR 565	Pharmaceutical Marketing	2	2	-	PHAR 466	PHAR 570	Pharmacoeconomics	2	2	-	PHAR 466
PHAR 567	Toxicology	2	2	-	PHAR 441	PHAR 572	Over the counter medicines (OTC)	2	2	-	PHAR 547
	Faculty Elective	3	3	-	--		Faculty Elective	3	3	-	--
	Faculty Elective	3	3	-	--						
Total		17	16	2		Total		15	15	-	

Course Description

PHAR222: Pharmaceutical Organic Chemistry (3 credit hours)

Review of organic functional groups with emphasis on the physicochemical properties of biological importance such as carboxylic acid and its derivatives, amines, sulfuric acids and sulfonic acids, sulfonamides, carbonates and urea's. Chemistry of aliphatic and aromatic heterocycles with emphasis on five and six membered ring and fused rings heterocycles. Stereochemistry of organic compounds; chirality, enantiomers and diastereomers, conformational and geometrical isomerism, and the stereoselectivity in nature.

Prerequisite: CHEM217

PHAR225: Pharmaceutical Analytical Chemistry (3 credit hours)

Conventional analytical methods including quantitative and qualitative analysis, stoichiometric calculations, concepts of chemical equilibrium, titrimetric methods including: acid-base titration, compleximetric titration, precipitation reactions and titrations, concerning on the methods used in pharmaceutical products analysis. In addition, this course gives information about the pharmacopeias and the methods used in these pharmacopeias for the analysis of pharmaceutical preparations.

Prerequisite: CHEM103

PHAR226: Chemistry of Heterocycles (2 credit hour)

The structure, nomenclature and the properties of saturated and aromatic heterocyclic compounds with emphasis on pentacyclic, hexacyclic, and conjugated ones. Examples of natural and medicinal heterocyclic compounds are also provided.

Pre- or co-requisite: PHAR222

PHAR321: Medicinal Chemistry I (3 credit hours)

Medicinal chemistry of drugs with special emphasis on the pharmacokinetic, pharmacodynamic. Effect of the chemical structure on drugs' interaction with different body receptors is demonstrated. Metabolism of drugs and factors affecting it, medicinal chemistry of drugs acting on the central nervous system (CNS), the autonomic nervous system (ANS), and medicinal chemistry of opioids.

Prerequisite: PHAR222

PHAR322: Medicinal Chemistry 2 (3 credit hours)

Cardiovascular system, and drugs used for management of diabetes, non-steroidal anti-inflammatory drugs, steroidal hormones, drugs used for peptic ulcer disease.

Prerequisite: PHAR321

PHAR323: Pharmaceutical Instrumental Analysis (3 credit hours)

Spectral methods of analysis including UV-Visible, Infra-Red (IR), Nuclear Magnetic Resonance (NMR), and Mass Spectroscopy (MS). Types of instrumental analyses such as chromatographic separation techniques.

Prerequisite: CHEM225

PHAR329: Pharmaceutical Analytical chemistry & Instrumental Analysis lab (1 credit hour)

Spectral methods of analysis including: Ultra violet/ visible radiation(UV/Visible), Infra-Red (IR), Nuclear Magnetic Resonance (NMR), and Mass Spectroscopy (MS). Types of instrumental analyses such as chromatographic separation techniques such as high performance liquid chromatography and gas chromatography and their applications in the quality control of pharmaceutical preparations.

Pre- or co-requisite: PHAR323

PHAR334: Pharmacognosy and Phytochemistry (3 credit hours)

Introduction to pharmacognosy and phytochemistry and includes the study of chemical groups such as glycosides, alkaloids, volatile oils, terpenes and others. An extensive study of medicinal plants including their scientific names, natural products of each plant group, the existence, parts used and their medical use. Methods of isolation, characterization of active herbal compounds and their biological activities.

Pre- or co-requisite: PHAR222

PHAR336: Pharmacognosy and Phytochemistry Lab (1 credit hour)

Important practical methods to identify and examine medicinal plants. Isolation, identification of natural products present in medicinal plants.

Pre- or co-requisite: PHAR333

PHAR341: Pharmacology 1 (3 credit hours)

Basic principles of pharmacology. Introduction to drugs' pharmacokinetic and pharmacodynamic principles, pharmacology of drugs acting on the central nervous system (CNS), the autonomic nervous system (ANS), opioids, local anesthetics, and non-steroidal anti-inflammatory drugs.

Prerequisite: MED372

PHAR342: Pharmacology 2 (3 credit hours)

Pharmacology of drugs acting on the cardiovascular, renal, respiratory and gastrointestinal systems.

Prerequisite: PHAR341

PHAR351: Pharmaceutics 1 (3 credit hours)

Integration of the principles of physical pharmacy and traditional and modern pharmaceutical dosage forms. Oral solutions, otic, nasal and ophthalmic preparations, and sterile pharmaceutical dosage forms.

Prerequisite: PHAR222

PHAR353: Pharmacy Practice Laboratory 1 (1 credit hour)

The first in the series of pharmacy practice labs that connect the theoretical courses in pharmacy with pharmacy practice. Methods to evaluate vital signs, and medical prescriptions (types and reading). Practical methods for preparing, evaluating and dispensing pharmaceutical solutions with proper patient counseling.

Pre- or co-requisite: PHAR351

PHAR354: Pharmaceutics 2 (3 credit hours)

Integration of the principles of physical pharmacy and traditional and modern pharmaceutical dosage forms. Suspensions, emulsions, aerosols, and dermatological and rectal route preparations.

Prerequisites: PHAR351

PHAR356: Pharmacy Practice Laboratory 2 (1 credit hour)

The second in the series of pharmacy practice labs that connect the theoretical courses in pharmacy with pharmacy practice. Practical methods for preparing semi-solid pharmaceutical preparations such as creams and suppositories, and dispersed pharmaceutical preparations such as suspensions and emulsions. Evaluating and dispensing these dosage forms with proper patients counseling.

Pre- or co-requisite: PHAR354

PHAR361: Clinical Biochemistry (3 credit hours)

Biological and metabolic disturbances related to various disease states. Diagnostic procedures that help in evaluating the efficiency of different body organs.

Prerequisite: MED372

PHAR366: Drug Information Resources (1 credit hour)

Various resources for information about drugs, and methods of searching for drug-related information in a fast and efficient manner.

Prerequisite: PHAR341

- PHAR401: Community Pharmacy (3 credit hours)**
Training for 8 consecutive weeks in a registered community pharmacy inside Jordan. Pharmacy department, drug brand names, Pharmacy management and patient counseling will be covered.
Prerequisite: Students are eligible for this training only after passing 130 credit hours.
- PHAR421: Medicinal Chemistry 3 (3 credit hours)**
Medicinal chemistry of chemotherapeutic agents including antibacterial, antifungal, antiviral, antiparasitic and anticancer agents.
Prerequisite: PHAR322
- PHAR433: Phytotherapy (3 credit hours)**
Locally and internationally registered plant medications that are used in therapy of diseases and disorders of different body systems including the nervous, cardiovascular, gastrointestinal, respiratory, renal, endocrine, dermatological and musculoskeletal systems. Medical uses of herbal drugs, method and duration of use, drug interactions, and adverse effects.
Prerequisite: PHAR334
- PHAR441: Pharmacology 3 (3 credit hours)**
Pharmacology of chemotherapeutic agents including antibacterial, antifungal, antiviral, antiparasitic and anticancer agents. Pharmacology of hormones and drugs acting on the endocrine system.
Prerequisite: PHAR342
- PHAR446: Therapeutics 1 (3 credit hours)**
Pharmacotherapy of cardiovascular diseases, renal systems, respiratory, and gastrointestinal endocrine and in relation to the pathophysiologic conditions of the patient. Concepts of drug action, therapeutic uses, goals of treatment, therapeutic plan, patient counseling, drug monitoring and evaluation of the therapeutic outcomes. Methods of interacting and supporting other members of the medical care team by developing and evaluating patient's therapeutic plans, and offering alternative therapeutic options/plans when needed
Prerequisite: PHAR342
- PHAR451: Pharmaceutics 3 (3 credit hours)**
Integration of the principles of physical pharmacy, and traditional and modern pharmaceutical dosage forms. Solid pharmaceutical dosage forms such as tablets, hard and soft gelatin capsules, powders and granules.
Prerequisite: PHAR354

PHAR453: Pharmaceutical Microbiology (3 credit hours)

Mechanisms of action and biological properties of antibiotics and chemical compounds that are used clinically to treat different types of microbial diseases. Development of microorganism's resistance, and methods for preventing or reducing such resistance, methods of sterilization.

Prerequisite: MED372

PHAR454: Pharmacy Practice Laboratory 3 (1 credit hour)

The third in the series of pharmacy practice labs that connect the theoretical courses in pharmacy with pharmacy practice. Practical methods for preparing different types of solid pharmaceutical dosage forms, and evaluating and dispensing these dosage forms with the proper patient counseling.

Pre- or co-requisite: PHAR451

PHAR456: Biopharmaceutics and Pharmacokinetics (3 credit hours)

Physico-chemical and biological factors involved in the absorption, distribution, and elimination of drugs as well as method of Calculating drug levels in blood and urine after single or multiple dosing orally or intravenously. Concepts of bioavailability and bioequivalence

Prerequisite: PHAR451

PHAR458: Pharmaceutical Technology (3 credit hours)

This course covers methods for the development and delivery of modern Pharmaceutical formulations such as solutions, Disperse Systems, solid dosage forms and sterile dosage forms based on the physico-chemical properties of drugs.

Prerequisite: PHAR451

PHAR460: Pharmaceutical Biotechnology (3 credit hours)

Principles and foundations of biotechnology and genetic engineering. Isolation of the gene and inserting it into gene vectors to create recombinant DNA molecules that will facilitate the production of different drugs using biotechnology. Protein drug production including analysis, manufacture and purification in addition to the current biological products found in the market

Prerequisite: PHAR453

PHAR461: Immunology and Vaccines (2 credit hours)

Basic principles of immunology and their relation to diseases and therapy. Different types of vaccines, and their mechanisms of action.

Prerequisite: MED372

- PHAR464: Pharmaceutical Microbiology and Biotechnology Laboratory (1 credit hour)**
Methods of culturing, staining and identifying bacteria. Bacterial metabolism. The way bacteria are affected by antibiotics. Essentials of sterilization and quantifying microorganism growth and the methods of producing antibiotics using Biotechnological techniques.
Pre- or co-requisite: PHAR455
- PHAR466: Ethics and Pharmacy Practice (2 credit hours)**
Ethics of pharmacy profession; the principles of pharmacy management, pharmaceutical marketing and methods of communicating with patients and medical care team. Current laws governing the practice of pharmacy profession and the registration of drugs in Jordan.
Prerequisite: PHAR441
- PHAR504: Selected Topics 1 (1 credit hour)**
A selected topic in pharmaceutical sciences will be assigned to students to fulfill certain academic requirements.
Prerequisite: Dean's approval
- PHAR505: Selected Topics 2 (2 credit hours)**
A selected topic in pharmaceutical sciences will be assigned to students to fulfill certain academic requirements.
Prerequisites: Dean's approval
- PHAR521: Advanced Medicinal Chemistry (3 credit hours)**
New trends in medicinal chemistry. Methods of developing new drugs and their possible metabolism.
Prerequisite: PHAR421
- PHAR522: Drug Design (3 credit hours)**
Essential principles of drug design and synthesis. Studying methods of high-throughput synthesis and computer modeling
Biochemical basis for novel mechanisms of drug action.
Prerequisite: PHAR421
- PHAR523: Nuclear Pharmacy (3 credit hours)**
Essentials of nuclear pharmacy, method of preparing radioactive isotopes in nuclear reactors, methods of preparing radioactive pharmaceutical formulations used in treatment and diagnosis of diseases, quality control methods pertaining to these formulations.
Prerequisite: PHAR421

PHAR524: Radiation Technology (3 credit hours)

Various uses of pharmaceutical radiation technology with special emphasis on the uses of radioactive isotopes in the diagnosis, therapy of some pathological conditions.

Prerequisite: PHAR421

PHAR525: Advanced Chemistry of Natural Products (3 credit hours)

Methods and techniques of isolation, identification and biosynthesis of naturally occurring compounds and their chemical reactions.

Prerequisites: PHAR421

PHAR526: Pharmaceutical Quality Control (3 credit hours)

This course covers quality control systems for pharmaceutical operations in industry and various methods of ensuring quality control of pharmaceutical preparations.

Pre- or co-requisite: PHAR451

PHAR527: Toxic Plants (3 credit hours)

Important toxic plants, their existence, the toxic symptoms, antidotes, drugs to treat intoxication.

Prerequisites: PHAR421

PHAR528: Alternative Medicine (3 credit hours)

Methods of alternative treatment and complementary medicine including phytotherapy, Chinese, German and Indian medicine, chiropractics, treatment with bee poison, functional therapy, macrobiotics.

Prerequisites: PHAR433

PHAR547: Therapeutics 2 (3 credit hours)

Pharmacotherapy of neurological and psychiatric disorders, infectious diseases, immunological and hematological diseases, and tumors in relation to the pathophysiologic conditions of the patient. Concepts of drug action, therapeutic uses, goals of treatment, therapeutic plan, patient counseling, drug monitoring and evaluation of the therapeutic outcomes. Methods of interacting and supporting other members of the medical care team by developing and evaluating patient's therapeutic plans, and offering alternative therapeutic options/plans when needed.

Prerequisite: PHAR446

PHAR549: Clinical Cases (1 credit hour)

Discussion of clinical cases of patients suffering from various diseases to develop clinical skills necessary to solve problems related to supplying patients with cost-effective and safe treatment.

Pre- or co-requisite: PHAR547

PHAR554: Advanced Pharmaceutical Technology (3 credit hours)

Important systems used in the production of different dosage forms such as solutions, semi solid preparations and sterile dosage forms.

Prerequisite: PHAR451

PHAR555: Drug Delivery Systems (3 credit hours)

Development of different dosage forms that improve drug delivery to the human body based on the physico-chemical properties of drugs.

Prerequisite: PHAR451

PHAR556: Advanced Industrial Pharmacy (3 credit hours)

Design of traditional and non-traditional dosage forms, and the physicochemical principles that alter its stability, different forms of capsule and tablet design. Liquid dosage forms and the industrial systems that are currently applied for the manufacturing of such dosage forms.

Prerequisite: PHAR451

PHAR558: Pharmaceutical Regulatory Affairs (3 credit hours)

Topics on the drug approval process, current Good Manufacturing Practices, Good Clinical Practices, quality system compliance and the corresponding documentation requirements, and FDA inspection processes and enforcement options.

Prerequisite: PHAR451

PHAR559: Drug Stability(3 credit hours)

Factors that affect the stability, quality and general safety of pharmaceutical products.

Prerequisite: PHAR451

PHAR577: Pharmaceutical Intellectual Property (3 credit hours)

Drug product life cycle, types and principles of intellectual property with an emphasis on the application of these principles within the pharmaceutical industry, importance of intellectual property to the PI, research and development (R&D) issues, data exclusivity, patent protection, trademarks, and Trade Related Aspects of Intellectual Property Rights (TRIPs) for pharmaceutical products, recording, ownership and registration of IP, strategies, planning and commercialization of IP.

Prerequisite: PHAR451

PHAR560: Therapeutics 3 (3 credit hours)

Pharmacotherapy of pediatric and geriatric diseases, and women and men health issues in relation to the pathophysiologic conditions of the patient. Concepts of drug action, therapeutic uses, goals of treatment, therapeutic plan, patient counseling, drug monitoring and evaluation of the therapeutic outcomes. Methods of interacting and supporting other members of the medical care team by developing and evaluating patient's therapeutic plans, and offering alternative therapeutic options/plans when needed.

Prerequisite: PHAR547

PHAR562: Clinical Nutrition (2 credit hours)

Basic principles of clinical nutrition during both normal and diseased conditions. Obesity and its relation with physical exercises, home parenteral nutrition, food-induced allergy, special nutrition for disease states, and the diagnosis of diseases related to vitamins and minerals deficiency.

Prerequisite: PHAR361

PHAR565: Pharmaceutical Marketing (2 credit hours)

The marketing ideas and techniques to build practices, develop innovative services, and generate business for employers or organizations within the scope of pharmacy.

Prerequisite: PHAR466

PHAR567: Toxicology (3 credit hours)

Comprehensive discussion of the principles of toxicology, common antidotes, and skills to deal with poisoning by drug and medical products.

Prerequisite: PHAR441

PHAR569: Pharmacy Practice (2 credit hours)

Advances and new trends in the pharmacy practice, and the mechanisms for their efficient application.

Prerequisite: PHAR466

PHAR570: Pharmacoeconomics (2 credit hours)

Basic principles of pharmaceutical economics. It defines terminology used in research and covers the application of economic-based evaluation methods for pharmaceutical products and services

Prerequisite: PHAR466

- PHAR571: Advanced Pharmaceutical Biotechnology (3 credit hours)**
Techniques used in pharmaceutical biotechnology such as molecular biology, gene synthesis and genetic technology. Methods for the synthesis, purification, and formulation of proteins in pharmaceutical dosage forms are also discussed.
Prerequisite: PHAR460
- PHAR572: Over the Counter Drugs (2 credit hours)**
Medications dispensed without prescription and patient care pertaining for common symptoms, related diseases, treatments, and determining cases that should be seen by a physician.
Prerequisite: PHAR547
- PHAR573: Advanced Pharmaceutical Microbiology (3 credit hours)**
Properties of pathogens (bacteria and fungi) in their single (planktonic) and aggregate (biofilm) forms, effect of antibiotics on both forms, comparison of antibiotic resistance in both cases and determination of best methods for eradication. Properties of toxins and proteins that are produced by various microorganisms leading to enhancement of their virulence and resistance to antibiotics. Methods of separation, analysis and characterization of these products.
Prerequisite: PHAR460
- PHAR574: Protein and Gene Therapy (3 credit hours)**
Chemical, pharmaceutical and the therapeutic aspects of proteins and genes medications.
Prerequisite: PHAR460
- PHAR575: Advanced Chemistry of Natural Products (3 credit hours)**
The course focuses on methods and techniques of isolation, identification and biosynthesis of naturally occurring compounds and their chemical reactions.
Prerequisites: PHAR451
- PHAR576: Cosmetic preparations (3 credit hours)**
Methods used for the development of various types of cosmetic products starting from the idea of the preparation, its formulation, manufacturing, and evaluation for their quality and stability. Proper methods of storage and usage of cosmetic products are also discussed.
Prerequisite: PHAR451
- PHAR577: History of Pharmacy and Therapy (3 credit hours)**
History and development of pharmacy profession and the contribution of Islamic civilization to the Pharmaceutical sciences.
Prerequisite: PHAR451

PHAR578: Drug Registration and Approval (3 credit hours)

This course discusses methods of drugs approval and registration. The course covers the phases of drug studies on animals and other clinical studies required.

Prerequisite: PHAR451

PHAR579: Communications Skill in Pharmacy (3 credit hours)

This course discusses the proper communication skills in the pharmaceutical environment. The course also discusses the specific requirements for communicating with elderly and patient with special needs to provide distinguished and specialized pharmaceutical services. The course covers the communication skills used in education, development of creative services, supervision, resolving conflicts and dealing with different groups of the society.

Prerequisite: PHAR466

PHAR585: Advanced Pharmaceutical Management (3 credit hours)

Personal management, operations management, managing people, marketing, purchasing, value-added services, and managing risks.

Prerequisite: PHAR466

PHAR586: Pharmacoepidemiology (3 credit hours)

An introduction to pharmacoepidemiology as well as sections on data sources, methodology and applications, and evaluating the safety and effectiveness of medicines.

Prerequisite: PHAR466

PHAR590: Advanced Pharmacology (3 credit hours)

Advanced principles of pharmacology, an in-depth assessment of selected groups of drugs with specific emphasis on the sites and mechanisms of drug action and indications, contraindications, adverse effects and drug-drug interactions.

Prerequisite: PHAR441

PHAR591: Advanced Pharmacy Practice (3 credit hours)

This course covers new developments and trends in the pharmacy practice, and discusses the mechanisms for their efficient application.

Prerequisite: PHAR451

PHAR592: Advanced Therapeutics (3 credit hours)

This course discusses the therapeutics for some clinical cases and selected drugs in a comprehensive and detailed manner.

Prerequisite: PHAR446

PHAR593: Molecular Pharmacology (3 credit hours)

Essential principles of molecular pharmacology. It also covers types of receptors, second messengers and cellular mechanisms of drug action. Genes, nucleic acids structure, replication and the control on these processes as sites of drug action are also discussed.

Prerequisite: PHAR441

PHAR594: Clinical Examination (3 credit hours)

This course covers medical terminologies and procedures used during physical examination and extraction of patient's medical history.

Prerequisite: PHAR446

PHAR595: Pharmacogenetics (3 credit hours)

This course discusses the essential principles of pharmacogenetics that enable students to interpret the variations in drug responses according to gender and race differences among patients.

Prerequisite: PHAR 441

PHAR596: Hospital Pharmacy (3 credit hours)

Development, functions, organization and administration of pharmaceutical services within a hospital. Methods of drug distribution, inventory control and purchasing. *Prerequisite: PHAR 401*

PHAR597: Clinical Pharmacology (3 credit hours)

Essential principles of clinical pharmacology, clinical uses, adverse effects, precautions, drug interactions and contraindications for selected groups of drugs.

Prerequisite: PHAR 441