

Doctor of Pharmacy (Pharm D.) Study Plan

University Compulsory Courses

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16 C.H

University Elective Courses

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9 C.H

Faculty Compulsory Courses

84 C.H

Line No.	Code	Course	C.H
102222	MED222B	BIOCHEMISTRY	3
103720	MED372	PATHOPHYSIOLOGY	3
302211	PHAR221A	PHARMACEUTICAL ORGANIC CHEMISTRY (1)	3
302221	PHAR222A	PHARMACEUTICAL ORGANIC CHEMISTRY (2)	3
302242	PHAR224B	PHARMACEUTICAL ORGANIC CHEMISTRY LABORATORY	1
302251	PHAR225A	PHARMACEUTICAL ANALYTICAL CHEMISTRY	3
302260	PHAR226	PHARMACEUTICAL INSTRUMENTAL ANALYSIS	3
302271	PHAR227A	PHARMACEUTICAL ANALYTICAL CHEMISTRY LABORATORY	1
302511	PHAR251A	BASIC MICROBIOLOGY	3
303211	PHAR321A	MEDICINAL CHEMISTRY (1)	3
303222	PHAR322B	MEDICINAL CHEMISTRY (2)	2
303410	PHAR341	PHARMACOLOGY (1)	3
303421	PHAR342A	PHARMACOLOGY 2	3
303511	PHAR351A	PHARMACEUTICS (1)	3
303531	PHAR353A	PHARMACY PRACTICE LABORATORY (1)	1
303543	PHAR354C	PHARMACEUTICS(2)	3
303561	PHAR356A	PHARMACY PRACTICE LABORATORY(2)	1
303610	PHAR361	CLINICAL BIOCHEMISTRY	3
304212	PHAR421B	MEDICINAL CHEMISTRY(3)	2
304221	PHAR422A	MEDICINAL CHEMISTRY(4)	2
304412	PHAR441B	PHARMACOLOGY (3)	3
304511	PHAR451A	PHARMACEUTICS(3)	3
304541	PHAR454A	PHARMACY PRACTICE LABORATORY (3)	1
304562	PHAR456B	BIOPHARMACEUTICS AND PHARMACOKINETICS	3
304610	PHAR461	IMMUNOLOGY AND VACCINES	2
304620	PHAR462	PHARMACEUTICAL MICROBIOLOGY AND BIOTECHNOLOGY	3
304640	PHAR464	PHARMACEUTICAL MICROBIOLOGY AND BIOTECHNOLOGY LABORATORY	1
305620	PHAR562	CLINICAL NUTRITION	2
901021	MATH102A	CALCULUS(FOR BIO.SCI.STUDENTS)	3
911031	CHEM103A	GENERAL CHEMISTRY	3
911072	CHEM107B	GENERAL CHEMISTRY LAB	1
921031	PHY103A	GENERAL PHYSICS	3
931030	BIO103	GENERAL BIOLOGY	3
931070	BIO107	GENERAL BIOLOGY (PRACTICAL)	1
1731160	CS116	SELLECTED PROGRAMMING LANGUAGES (FOR NON COMPUTER SCIENCE INFORMATION STUDENTS)	3

Faculty Elective Courses

9 C.H

Line No.	Code	Course	C.H
305040	PHAR504	SELECTED TOPICS (1)	1
305050	PHAR505	SELECTED TOPICS (2)	2
305331	PHAR533A	ALTERNATIVE MEDICINE	3
305710	PHAR571	ADVANCED PHARMACEUTICAL BIOTECHNOLOGY	3
305720	PHAR572	ADVANCED PHARMACEUTICAL MICROBIOLOGY	3
305730	PHAR573	COMMUNICATION SKILLS IN PHARMACY	3
305740	PHAR574	ADVANCED PHYSICAL PHARMACY	3
305750	PHAR575	ADVANCED PHARMACEUTICAL TECHNOLOGY	3
305760	PHAR576	COSMETIC PREPARATIONS	3
305770	PHAR577	ADVANCED INDUSTRIAL PHARMACY	3
305780	PHAR578	HISTORY OF PHARMACY AND THERAPY	3
305790	PHAR579	DRUG REGISTRATION AND APPROVAL	3
305810	PHAR581	ADVANCED MEDICINAL CHEMISTRY	3
305820	PHAR582	DRUG DESIGN AND SYRTHESIS	3
305830	PHAR583	NUCLEAR PHARMACY	3
305840	PHAR584	RADIATION TECHNOLOGY	3
305850	PHAR585	QUALITY CONTROL	3
305910	PHAR591	ADVANCED PHARMACY PRACTICE	3
305920	PHAR592	PHARMACOECONOMICS	3
305930	PHAR593	CLINICAL PHARMACOLOGY	3
305950	PHAR595	MOLECULAR PHARMACOLOGY	3
305960	PHAR596	PHYSICAL EXAMINATION	3
305970	PHAR597	PHARMACOGENETICS	3

Specialization Compulsory Courses

101 C.H

Line No.	Code	Course	C.H
101120	MED112	GENERAL ANATOMY	3
101121	MED112A	GENERAL ANATOMY(LAB)	0
101140	MED114	CELL BIOLOGY & HISTOLOGY	3
101141	MED114A	CELL BIOLOGY (LAB)	0
101320	MED132	GENERAL PHYSIOLOGY	3
102310	MED231	GENERAL PATHOLOGY	3
102311	MED231A	GENERAL PATHOLOGY (LAB)	0
183111	PH311A	BIostatISTICS	2
303321	PHAR332A	CHEMISTRY OF NATURAL PRODUCTS(FOR PHARMD STUDENTS)	3
303440	PHAR344	INTRODUCTION TO THERAPEUTICS(FOR PHARMD STUDENTS)	1
303552	PHAR355B	ETHICS AND PHARMACY PRACTICE(FOR PHARM D STUDENTS)	2
303620	PHAR362	PHARMACY MANGEMENT(FOR PHARM D STUDENTS)	2
303630	PHAR363	DRUG INFORMATION RESOURCES(FOR PHARM D STUDENT)	1
304020	PHAR402	COMMUNITY PHARMACY(FOR PHARMD STUDENTS)	3
304311	PHAR431A	PHYTOTHERAPY(FOR PHARM D STUDENTS)	3

Doctor of Pharmacy (Pharm D)

Courses' Description

PHAR226 Pharmaceutical Instrumental Analysis 3 C.H

This course introduces the student to spectral methods of analysis including UV-Visible, Infra-Red (IR), Nuclear Magnetic Resonance (NMR), and Mass Spectroscopy (MS). The course also covers other types of instrumental analyses such as chromatographic separation techniques. *Prerequisite: CHEM233*

PHAR251 Basic Microbiology 3 C.H

This course deals with basic biology of bacteria, viruses, fungi, and protozoa, with emphasis on their microbial genetics, metabolism, pathogenesis. Principles of immunobiology, and infection prevention and control are also covered. *Prerequisite: BIO103*

PHAR321 Medicinal Chemistry I 3 C.H

This course introduces students to medicinal chemistry of drugs with special emphasis on the pharmacokinetic, pharmacodynamic and physicochemical properties in relation to biological activity. The effect of the chemical structure on drugs' interaction with different body receptors is demonstrated. The metabolism of drugs and factors affecting it is fully explained. The course also introduces the students to the basic principles of drug design. *Prerequisite: CHEM212*

PHAR322 Medicinal Chemistry 2 2 C.H

The course covers the medicinal chemistry of drugs acting on the central nervous system (CNS), the autonomic nervous system (ANS), the cardiovascular system, and drugs used for management of diabetes. *Prerequisite: PHAR321*

PHAR332 Chemistry of Natural Products 3 C.H

This course covers basic information about classes of natural products, secondary metabolites, and their distribution. The course also deals with plants and microorganisms as sources for natural drugs. Methods for discovering natural drugs and the importance of these drugs in pharmaceutical care are also included. *Prerequisite: CHEM212*

PHAR341 Pharmacology 1 3 C.H

This course discusses the basic principles of pharmacology. An 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, autacoids and non-steroidal anti-inflammatory drugs are included. *Prerequisite: MED372*

PHAR342 Pharmacology 2 3 C.H

This course covers the pharmacology of drugs acting on the cardiovascular, renal, respiratory and gastrointestinal systems. *Prerequisite: PHAR341*

PHAR344 Introduction to Therapeutics 1 C.H

This course covers the basic principles of therapeutics. *Prerequisite: PHAR341*

PHAR351 Pharmaceutics 1 3 C.H

This course integrates the principles of physical pharmacy and traditional and modern pharmaceutical dosage forms. Covered topics are oral solutions, otic, nasal and ophthalmic preparations, and sterile pharmaceutical dosage forms. *Prerequisite: CHEM212*

PHAR 353 Pharmacy Practice Laboratory 1 1C.H (3 practical ours)

This course is the first in the series of pharmacy practice labs that connect the theoretical courses in pharmacy with pharmacy practice. This course discusses the methods to evaluate vital signs, and medical prescriptions (types and reading). It also covers the practical methods for preparing, evaluating and dispensing pharmaceutical solutions with proper patient counseling. *Pre- or co-requisite: PHAR351*

PHAR354 Pharmaceutics 2 3 C.H

This course integrates the principles of physical pharmacy and traditional and modern pharmaceutical dosage forms. Covered topics are suspensions, emulsions, aerosols, and dermatological and rectal preparations. *Prerequisites: PHAR351*

PHAR355 Ethics and Pharmacy Practice 2 C.H (for PharmD students)

This course discusses the ethics of pharmacy profession; the principles of pharmacy management, the pharmaceutical marketing and the methods of communicating with patients and medical care team. The course also deals with current laws that govern the practice of pharmacy profession and the registration of drugs in Jordan. *Pre- or co-requisite: PHAR351*

PHAR356 Pharmacy Practice Laboratory 2 1 C.H (3 practical hours)

This course is the second in the series of pharmacy practice labs that connect the theoretical courses in pharmacy with pharmacy practice. This course discusses practical methods for preparing semi-solid pharmaceutical preparations such as creams and suppositories, and dispersed pharmaceutical preparations such as suspensions and emulsions. The course includes evaluating and dispensing these dosage forms with proper patients counseling. *Pre- or co-requisite: PHAR354*

PHAR361 Clinical Biochemistry 3 C.H

This course discusses the biological and metabolic disturbances related to various disease states. It also covers diagnostic procedures that help in evaluating the efficiency of different body organs. *Prerequisite: MED372*

PHAR362 Pharmacy Management 3 C.H (for PharmD students)

This course discusses methods for managing personnel/employees and various processes in pharmaceutical institutions. *Prerequisite: PHAR355*

PHAR363 Drug Information Resources 1 C.H (for PharmD students)

This course covers various resources for information about drugs. This course enable student to search for drug-related information in a fast and efficient manner. *Prerequisite: PH311*

PHAR402 Community Pharmacy 3 C.H (for PharmD students; 8 practical weeks)

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 training only after successfully completing 130 C.H. *Prerequisite: Successfully completing 130 C.H.*

PHAR421 Medicinal Chemistry 3 2 C.H

The course covers the medicinal chemistry of opioids, non-steroidal anti-inflammatory drugs, steroidal hormones, & other steroid derivatives, anti-hyperlipidemic drugs, anti-histamines, local anesthetics and drugs used for peptic ulcer disease.

Prerequisite: PHAR322

PHAR422 Medicinal Chemistry 4 2 C.H

The course covers the medicinal chemistry of chemotherapeutic agents including antibacterial, antifungal, antiviral, antiparasitic and anticancer agents. The course also presents an introduction to nuclear pharmacy. *Prerequisite: PHAR421*

PHAR431 Phytotherapy (for Pharm D students) 3 C.H

The course discusses locally and internationally registered plant medications that is used in therapy of diseases and disorders of different body systems including the nervous, cardiovascular, gastrointestinal, respiratory, renal, endocrine, dermatological and musculoskeletal systems. The course focuses on the medical uses of drugs, method and duration of use, drug interactions, and adverse effects. *Prerequisite: PHAR332*

PHAR441 Pharmacology 3 3 C.H

This course discusses the pharmacology of chemotherapeutic agents including antibacterial, antifungal, antiviral, antiparasitic and anticancer agents. This course also discusses the pharmacology of hormones and drugs acting on the endocrine system. *Prerequisite: PHAR342*

PHAR442 Therapeutics- Immunology Hematology and Oncology (for PharmD students) 2 C.H

This course includes medications used for immunological and hematological diseases, and tumors in relation to the pathophysiologic conditions of the patient. The course discusses concepts of drug action, therapeutic uses, goals of treatment, therapeutic plan, patient counseling, drug monitoring and evaluation of the therapeutic outcomes. Students learn 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: PHAR461 and PHAR441

PHAR443 Therapeutics- Neurological & Psychiatric Disorders (for PharmD students) 2 C.H

This course includes medications used for neurological and psychiatric disorders in relation to the pathophysiologic conditions of the patient. The course discusses concepts of drug action, therapeutic uses, goals of treatment, therapeutic plan, patient counseling, drug monitoring and evaluation of the therapeutic outcomes. Students learn 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: PHAR344*

PHAR444 Therapeutics- Cardiovascular System (for PharmD students) 2 C.H

This course includes medications used for cardiovascular diseases in relation to the pathophysiologic conditions of the patient. The course discusses concepts of drug action, therapeutic uses, goals of treatment, therapeutic plan, patient counseling, drug monitoring and evaluation of the therapeutic outcomes. Students learn 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. *Pre- or co-requisite: PHAR442*

PHAR445 Therapeutics- Respiratory and Gastrointestinal Systems (for PharmD students) 2 C.H

This course includes medications used for respiratory and gastrointestinal diseases in relation to the pathophysiologic conditions of the patient. The course discusses concepts of drug action, therapeutic uses, goals of treatment, therapeutic plan, patient counseling, drug monitoring and evaluation of the therapeutic outcomes. Students learn 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. *Pre-requisite: PHAR342- Co-requisite: PHAR443*

PHAR447 Clinical Cases 1 (for PharmD students, 3 practical hours) 1C.H

This course helps students to develop clinical skills necessary to solve problems related to supplying patients with cost-effective and safe treatment. This course covers clinical cases of patients suffering from psychiatric, neurological, respiratory and gastrointestinal diseases. *Pre- or co-requisite: PHAR445*

PHAR448 Clinical Cases 2 (for PharmD students, 3 practical hours) 1 C.H

This course helps students developing clinical skills necessary to solve problems related to supplying patients with cost-effective and safe treatment. This course covers clinical cases of patients suffering from hematological and immune disorders, tumors and diseases of the cardiovascular system. *Pre- or co-requisite: PHAR444*

PHAR451 Pharmaceutics 3 3 C.H

This course integrates the principles of physical pharmacy, and traditional and modern pharmaceutical dosage forms. This course covers solid pharmaceutical dosage forms such as tablets, hard and soft gelatin capsules, powders and granules. *Prerequisite: PHAR354*

PHAR452 Pharmaceutics 4 (for PharmD students) 2 C.H

This course covers methods for the development and delivery of modern pharmaceutical formulations based on the physico-chemical properties of drugs. *Prerequisite: PHAR451*

PHAR454 Pharmacy Practice Laboratory 3 (3 practical hours) 1 C.H

This course is the third in the series of pharmacy practice labs that connect the theoretical courses in pharmacy with pharmacy practice. This course covers practical methods for preparing different types of solid pharmaceutical dosage forms. The course also includes evaluating and dispensing these dosage forms with the proper patient counseling. *Pre- or co-requisite: PHAR451*

PHAR456 Biopharmaceutics & Pharmacokinetics 3 C.H

This course covers the 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. The concepts of bioavailability and bioequivalence are also discussed. *Prerequisite: PHAR451*

PHAR461 Immunology and Vaccines 2 C.H

This course covers the basic principles of immunology and their relation to diseases and therapy. The course also discusses different types of vaccines, and their mechanisms of action. *Prerequisite: MED372*

PHAR462 Pharmaceutical Microbiology and Biotechnology 3 C.H

This course discusses mechanisms of action and biological properties of antibiotics and chemical compounds that are used clinically to treat different types of microbial diseases. The course also covers the development of microorganism's resistance, and the methods for preventing or reducing such resistance. The course discusses various methods of sterilization. Principles of biotechnology, recombinant DNA technology, and some biotechnologically produced drugs are also covered. *Prerequisite: PHAR361*

PHAR464 Pharmaceutical Microbiology and Biotechnology Laboratory (1 C.H, 3 practical hours)

Students are trained on the methods of culturing, staining and identifying bacteria. Bacterial metabolism, the way bacteria are affected by antibiotics, the essentials of sterilization and quantifying microorganism growth and the methods of producing antibiotics using biotechnological techniques will also be covered. *Pre- or co-requisite: PHAR462*

PHAR504 Selected Topics 1 1 C.H

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 C.H

A selected topic in pharmaceutical sciences will be assigned to students to fulfill certain academic requirements. *Prerequisites: Dean's approval*

PHAR533 Alternative Medicine 3 C.H

This course discusses methods of alternative treatment and complementary medicine. The course covers phytotherapy, Chinese, German and Indian medicine, chiropractics, treatment with bee poison, functional therapy and macrobiotics. *Prerequisites: PHAR431*

PHAR541 Therapeutics- Endocrine and Renal 2 C.H Systems (for PharmD students)

This course includes medications used for endocrine and renal systems diseases in relation to the pathophysiologic conditions of the patient. The course discusses concepts of drug action, therapeutic uses, goals of treatment, therapeutic plan, patient counseling, drug monitoring and evaluation of the therapeutic outcomes. Students learn 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: PHAR344 and PHAR441*

PHAR542 Therapeutics- Pediatric Health 2 C.H (for PharmD students)

This course includes medications used for pediatric diseases in relation to the pathophysiologic conditions of the patient. The course discusses concepts of drug action, therapeutic uses, goals of treatment, therapeutic plan, patient counseling, drug monitoring and evaluation of the therapeutic outcomes. Students learn 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: PHAR541*

PHAR543 Therapeutics- Infectious Diseases 2 C.H (for PharmD students)

This course includes medications used for infectious diseases in relation to the pathophysiologic conditions of the patient. The course discusses concepts of drug action, therapeutic uses, goals of treatment, therapeutic plan, patient counseling, drug monitoring and evaluation of the therapeutic outcomes. Students learn 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. *Pre- or co-requisite: PHAR541*

PHAR544 Therapeutics- Woman and Man Health (for PharmD students) 2 C.H

This course includes medications used in cases special for woman such as (infertility, post-menopause, pregnancy, delivery, lactation, contraception), and cases special for men such as (prostate diseases, impotence and infertility), in relation to the pathophysiologic conditions of the patient. The course discusses concepts of drug action, therapeutic uses, goals of treatment, therapeutic plan, patient counseling, drug monitoring and evaluation of the therapeutic outcomes. Students learn 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. *Pre- requisite: PHAR542 and PHAR543*

PHAR545 Clinical Cases 3 1 C.H (for PharmD students, 3 practical hours)

This course helps students to develop clinical skills necessary to solve problems related to supplying patients with cost-effective and safe treatment. This course covers clinical cases of patients suffering from endocrine, renal system and infectious diseases. *Pre- or co-requisite: PHAR543*

PHAR546 Clinical Cases 4 1 C.H (for PharmD students, 3 practical hours)

This course helps students to develop clinical skills necessary to solve problems related to supplying patients with cost-effective and safe treatment. This course covers clinical cases in pediatrics, women and men health-related issues. *Pre- or co-requisite: PHAR544*

PHAR548 Therapeutics- Comprehensive 2 C.H (for PharmD students)

This course covers certain therapeutic situations that include diseases or disorders involving more than one system in the body. This course depends on a comprehensive view that takes into consideration the interactions of various diseases in the therapy of a patient. *Pre- or co-requisite: PHAR546*

PHAR551 Pharmacy Practice Laboratory 4 1 C.H (3 practical hours)

This course is the fourth in the series of pharmacy practice labs that connect the theoretical courses in pharmacy with the pharmacy practice. This course covers the practical methods for preparing sterile pharmaceutical preparations such as intravenous solutions. The course also deals with sterilization methods for parenteral preparations within clinical sittings. This course includes evaluating and dispensing these preparations with proper counseling for the patients and other health care team members. *Prerequisite: PHAR452*

PHAR553 Clinical Pharmacokinetics 3 C.H
(for PharmD students)

This course covers the applications of drug pharmacokinetics in clinical cases. The course discusses the effect of genetic factors, disease states, and medications on drug pharmacokinetics. Dose adjustment and methods of monitoring drug concentrations in the body are also included. *Prerequisite: PHAR456*

PHAR562 Clinical Nutrition 2 C.H

This course covers the basic principles of clinical nutrition during both normal and diseased conditions. This course also discusses 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*

PHAR563 Clinical Training 1 4 C.H
(for PharmD students, 4 practical weeks)

This course consists of four training weeks in different hospital departments. The training includes various activities such as attending the morning round, other clinical rounds, discussing clinical cases and detailed evaluation of the therapeutics of patients in the department. The goal of this course is to improve students' practical clinical skills that would enhance the positive contribution of clinical pharmacists in medical care at the hospital.

Prerequisite: successfully completing all courses: theoretical (both obligatory and elective), and practical as stated in the curriculum.

PHAR564 Introduction to Clinical Training 1 C.H
(for pharmD students, 3 practical hours)

This course provide students with the essential skills required for hospital training like recognizing various hospital departments, dealing with patients, extracting patient medical and pathological history, medical registry, databases and software used in the hospital

Pre- or co-requisite: PHAR546

PHAR566 Drug Literature Evaluation 2 C.H
(for PharmD students)

This course teaches the student, by example, methods of analyzing and evaluating published scientific articles and reports related to drugs and clinical cases.

Prerequisite: PHAR363

PHAR569 Hospital Pharmacy Training 4 C.H
(for PharmD student, 4 practical weeks)

Students are trained for 4 weeks in the hospital pharmacy department.

Prerequisite: successfully completing all courses: theoretical (both obligatory and elective), and practical as stated in the curriculum.

PHAR571 Advanced Pharmaceutical Biotechnology 3 C.H

This course covers techniques used in pharmaceutical biotechnology such as molecular biology, gene synthesis and genetic technology. The methods for the synthesis, purification, and formulation of proteins in pharmaceutical dosage forms are also discussed.

Prerequisite: PHAR462

PHAR572 Advanced Pharmaceutical Microbiology 3 C.H

This course covers the properties of pathogens (bacteria and fungi) in their single (planctonic) and aggregate (biofilm) forms, the effect of antibiotics on both forms, comparison of antibiotic resistance in both cases and determination of best methods for eradication. The

course also discusses the properties of toxins and proteins that are produced by various microorganisms leading to enhancement of their virulence and resistance to antibiotics. The methods of separation, analysis and characterization of these products are also covered.

Prerequisite: PHAR462

PHAR573 Communications Skill in Pharmacy 3 C.H

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: PHAR451*

PHAR574 Advanced Physical Pharmacy 3 C.H

This course discusses the physico-chemical characteristics affecting drug actions and the appropriate techniques used to study and evaluate these properties.

Prerequisite: PHAR451

PHAR575 Advanced Pharmaceutical Technology 3 C.H

This course covers the latest developments in the pharmaceutical technologies and equipments used in drug manufacturing. *Prerequisite: PHAR451*

PHAR576 Cosmetic preparations 3 C.H

This course covers the 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 Advanced Industrial Pharmacy 3 C.H

This course covers the various technologies used in drug production, packaging, and scale up.

Prerequisite: PHAR451

PHAR578 History of Pharmacy and Therapy 3 C.H

This course covers the history and development of pharmacy profession. *Prerequisite: PHAR451*

PHAR579 Drug Registration and Approval 3 C.H

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

PHAR581 Advanced Medicinal Chemistry 3 C.H

This course covers new trends in medicinal chemistry. The course discusses methods of developing new drugs and their possible metabolism.

Pre- or co-requisite: PHAR421

PHAR582 Drugs Design 3 C.H

This course covers essential principles of drug design and synthesis. The course includes studying methods of high-throughput synthesis and computer modeling and the biochemical basis for novel mechanisms of drug action. *Prerequisite: PHAR422*

PHAR583 Nuclear Pharmacy 3 C.H

This course covers essentials of nuclear pharmacy, method of preparing radioactive isotopes in nuclear reactors, and methods of preparing radioactive pharmaceutical formulations used in treatment and diagnosis of diseases. The quality control methods pertaining to these formulations are also covered.

Prerequisite: PHAR422

PHAR584 Radiation Technology 3 C.H

This course covers the various uses of pharmaceutical radiation technology with special emphasis on the uses of radioactive isotopes in the diagnosis and therapy of some pathological conditions. *Prerequisite: PHAR421*

PHAR585 Pharmaceutical Quality Control 3 C.H

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*

PHAR591 Advanced Pharmacy Practice 3 C.H

This course covers new developments and trends in the pharmacy practice, and discusses the mechanisms for their efficient application. *Prerequisite: PHAR451*

PHAR592 Pharmacoeconomics 3 C.H

This course covers the essential principles and applications of pharmaceutical economy, design forms and determinants of the outputs of drug therapy with emphasis on the practical aspects of these principles. *Prerequisite: PHAR451*

PHAR593 Clinical Pharmacology 3 C.H

This course covers the essential principles of clinical pharmacology. It also covers clinical uses, adverse effects, precautions, drug interactions and contraindications for selected groups of drugs. *Prerequisite: PHAR441*

PHAR595 Molecular Pharmacology 3 C.H

This course discusses the 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*

PHAR596 Physical Examination 3 C.H

This course covers medical terminologies and procedures used during physical examination and extraction of patient's medical history. *Prerequisite: MED372*

PHAR597 Pharmacogenetics 3 C.H

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: PHAR441*

**PHAR661 Clinical Training 2 12 C.H
(for PharmD student, 12 practical weeks)**

This course consists of 12 training weeks in different hospital departments. The training includes various activities such as attending the morning round, other clinical rounds, discussing clinical cases and detailed evaluation of the therapeutics of patients in the department. The goal of this course is to improve students' practical clinical skills that would enhance the positive contribution of clinical pharmacists in medical care at the hospital. *Prerequisite: successfully completing all courses: theoretical (both obligatory and elective), and practical as stated in the curriculum.*

**PHAR662 Clinical Training 3 12C.H
(for PharmD students, 12 practical weeks)**

This course consists of 12 training weeks in different hospital departments. The training includes various activities such as attending the morning round, other clinical rounds, discussing clinical cases and detailed evaluation of the therapeutics of patients in the department. The goal of this course is to improve students' practical clinical skills that would enhance the positive contribution of clinical pharmacists in medical care at the hospital.

Prerequisite: successfully completing all courses: theoretical (both obligatory and elective), and practical as stated in the curriculum.

**PHAR663 Research Training 4 C.H
(for PharmD students, 4 practical weeks)**

Methods and ethics of scientific clinical research and the correct methods of writing scientific proposals and articles are discussed. Students will also perform a research project in the hospital.

Prerequisite: successfully completing all courses: theoretical (both obligatory and elective), and practical as stated in the curriculum.

**PHAR664 Elective Training 4 C.H
(for PharmD students, 4 practical weeks)**

This course consists of 4 training weeks in one of the areas listed in the Selective List that is determined by the department of clinical pharmacy.

Prerequisite: successfully completing all courses: theoretical (both obligatory and elective), and practical as stated in the curriculum.

**PHAR667 Clinical Seminar 1 1 C.H
(for PharmD, students, 4 practical weeks)**

This course includes the discussion and evaluation of scientific articles and drug publications.

Prerequisite: successfully completing all courses: theoretical (both obligatory and elective), and practical as stated in the curriculum.

**PHAR668 Clinical Seminar 2 1C.H
(for PharmD, students, 4 practical weeks)**

This course includes the discussion and evaluation of scientific articles and drug publications.

Prerequisite: successfully completing all courses: theoretical (both obligatory and elective), and practical as stated in the curriculum.