Course Descriptions
Faculty of Pharmacy
Yarmouk University
2016

Pharmaceutical Organic Chemistry (PHAR 210) (3 credit hours): Pre-requisite CHEM 215

- This course aims to improve student's background in organic chemistry specialized in pharmaceutical products.
- The course includes studying the major functional groups; the chemistry of alcohols and phenols, ethers and epoxies, carbonyl compounds, amines, and biomolecules (amino acid and peptides) and their reactions; substitution and elimination reactions. Also, the course will go in details about heterocyclic compounds and poly aromatic compounds in pharmacy. Nomenclature, synthesis, classification, characteristics, importance in pharmaceutical application.
- Upon the completion of this course, the students expected to: Understand different reactions mechanism and multi-step synthetic planning. Differentiate between functional groups; alcohols and phenols, ethers and epoxy, carbonyl compounds, amines, amino acid and peptides, and study their reactions. Understand the chemistry of aromatic and heterocyclic compounds; from synthesis and reaction to pharmaceutical applications.

Pharmaceutical Organic Chemistry Lab (PHAR 211) (1 credit hour): Pre-requisite PHAR 210 or concurrent

- The aim of this course is to train the students on practical organic chemistry principles.
- This course includes studying physical and chemical properties of different functional groups, and the ability to differentiate between them by chemical reactions.
- Upon the successful completion of this course, the student expected to: Identify different organic functional groups; their physical and chemical properties practically. Synthesis different organic compounds by chemical reactions, separate, purify, and testing them by different techniques.

Biochemistry (PHAR 212) (3 credit hours): Pre-requisite PHAR 210

- The aim of this course is to study the biological principles and to understand the chemical and physiological properties of biomolecules.
- This course covers; chemical and physical properties of amino acids, proteins, enzyme kinetics, enzyme mechanism, and controlling enzyme activity. Also, includes different metabolic processes; metabolic circuitry, glucose transport and metabolism, glycogen metabolism, gluconeogenesis and the pentose shunt, and fatty acid metabolism.
- Upon the successful completion of this course, the student expected to: Understand the basic information's related to biochemical disturbances and metabolic disorders which give rise to certain diseases. Discuss human case studies, and explain the causative biochemical imbalance and physiological response.

Pharmaceutical Analytical Chemistry (PHAR 213) (3 credit hours): Pre-requisites CHEM 215

- This course aims to understand the basics of analytical chemistry methods and its applications in different fields of sciences, focusing on their applications in pharmaceutical sciences.
- The course includes the quantitative and descriptive analysis in chemical calculations besides to theoretically, chemically and mathematically applications of these methods. Also, to introduce different analytical methods from pharmacopeias such as the British and European as well.
- Upon the successful completion of this course, the student expected to: Be able to understand the basic principles of analytical chemistry To have a good knowledge about quality control in pharmaceutical drug analysis. How to extract the information from different pharmacopeias and employ them in different analytical aspects.

Pharmaceutical Analytical Chemistry Lab (PHAR 214) (1 credit hour): Pre-requisites CHEM 213

- This course focuses on the basic principles of analytical chemistry in pharmaceutical and chemical fields by performing different quantitative\qualitative experiments.
- Upon the successful completion of this course, the student expected to: Be able to apply the different pharmaceutical analytical aspects practically in the lab. Have enough knowledge and skills to prepare the proper pharmaceutical buffers and the chemical

solutions. Able to compare between different analytical methods derived from pharmacopeia

Physical Pharmacy (PHAR 215) (3credit hours): Pre-requisite CHEM 103 + MATH 101

- The course aims to study the physicochemical properties of the molecules, which used in the preparation of the drug and drug solutions.
- The course includes the surface active agents, colloids, and the factors that affect their roles in the manufacturing of drugs, the calculations of the complex formulations, the stability of drugs, by calculating its shelf-life and the factors that affect the stability of drugs. In addition, the course discus the solubility and the distribution phenomena through the membranes and the effect of the temperature in increasing the solubility of drug and its partition coefficient between the solvents.
- At the end of the course the student will have knowledge about: The theoretical and the basic principles of the physicochemical properties of drug molecules, pH, and the solubility. The different calculations used to understand the properties of different types of the dosage forms.

Physical Pharmacy Lab (PHAR 216) (1 credit hours): Pre-requisite PHAR 215 or concurrent

- The course aims to connect the theoretical course in physical pharmacy with practice.
- This course includes carrying several related experiments on: solubility, pH, pKa, density, viscosity, surface tension, chemical kinetics and adsorption.
- Upon successful completion of the course, students will be able to: State the physicochemical properties of drug molecules, pH, and solubility. Explain the role of surfactants, interfacial phenomenon and thermodynamic. Describe the flow behavior of fluids and concept of complexation. Analyze the chemical stability tests of various drug products.

Dispensing and Compounding of the Dosage Forms (PHAR 220) (3 credit hours): Prerequisite PHAR 215

- The course aims to study the methods of preparation of different types of pharmaceutical dosage forms such as (solutions, suspensions, emulsions, and ointments)
- The course includes all the information, and the principle calculating methods to produce the pharmaceutical dosage forms and the principles of pharmacological synthesis and packaging of the drug.
- At the end of the course the student will have knowledge about: The ability of using the different components in preparing the different pharmaceutical dosage forms. To have knowledge of how to deal with the appropriate calculations for the pharmaceutical product.

Pharmaceutical Calculations and Compounding Lab (PHAR 221) (1 credit hour): Prerequisite PHAR 220 or concurrent

- The course aims to practice preparation methods of different dosage forms.
- It includes practical application of preparing number of pharmaceutical dosage forms, basics of packaging and labeling.
- At the end of this course students are expected to: Identify and prepare different pharmaceutical dosage forms. Apply it in the workplace and society pharmacies and factories.

Physiology for Pharmacy Students (PHAR 230) (3 credit hours): Pre-requisite BIO 201

- This course aims to introduce the students to the basic body organs, function, and the integration between body systems.
- The course includes a discussion of various body systems such as nervous, respiratory, circulatory, and gastrointestinal systems.
- Upon completion of this course the students are expected to: Understand the basic functions of body systems. Identify the integration between body systems to achieve homeostasis.

Pathophysiology for Pharmacy Students (PHAR 231) (3 credit hours): Pre-requisite PHAR230

- This course focuses on the basic characteristics of systemic diseases and the deviation from normal function.
- The course includes the basic underlying mechanisms of diseases processes related to circulatory, gastrointestinal, respiratory, and endocrine system.
- Upon completion of this course the students are expected to: Identify the basic characteristics of various diseases. Discuss the basic underlying mechanisms of disease process.

Pharmacognosy and Phytochemistry (PHAR 310) (3 credit hours): Pre-requisite PHAR210

- The course aims to provide an introduction to Pharmacognosy, Phytochemistry and Phytotherapy.
- It includes a study of plant chemical groups (such as glycosides, alkaloids, steroids, volatile oils, terpenes…etc.). It discusses the medicinal plants taxonomy as well as their scientific names, the used parts, active ingredients, in addition to natural products extraction and medicinal use.
- After accomplishing this course, the students will be able to: Identify and examine medicinal plants. Apply methods in isolation, extraction, and identification of natural products.

Pharmacognosy and Phytochemistry Lab (PHAR 311) (1 credit hour): Pre-requisite PHAR 310 or concurrent

- The course aims to provide a practical introduction to Pharmacognosy and photochemistry.
- It includes a study of practical methods to identify and examine medicinal plants, in addition to, isolation, identification and extraction of natural products present in medicinal plants.
- After accomplishing this course, the students will be able to: Identify and examine medicinal plants. Apply methods in isolation, extraction, and identification of natural products.

Pharmaceutical Instrumental Analysis (PHAR 312) (3 credit hours): Pre-requisites PHAR 210 and PHAR 213

- The purpose of this course is to provide a basic understanding of the principles, instrumentation and applications of chemical analysis.
- This course deals with the analytical measurements and concerned with a wide variety of instrumentation and quality control fields in particular in analytical and pharmaceutical chemistry sciences.
- After completing of this course successfully, the student is expected to: To know the main concepts and requirements of instrumental analysis such as precision, accuracy, sensitivity, selectivity, detection limit, dynamic range, speeds of analysis, cost, safety and automation. To illustrate the main concepts related to different instrumental techniques both qualitative and quantitative instruments. To solve problems related to each type of instrument. To be able to interpret the spectrum and chromatographic outcomes.

Pharmaceutical Instrumental Analysis Lab (PHAR 313) (1 credit hour): Pre-requisites PHAR 312 or concurrent

- This is a practical course of pharmaceutical instrumental analysis. It aims to study most instrumental analysis methods and their applications in different aspects of science, in particular pharmacy, medicine, chemistry and environment.
- This course will introduce a quantitative method of analysis to determine the concentration of a given samples using different measures such as Beers Law in UV spectrophotometer, IR, NMR, AAS, limit test. It also performs a quality control experiments based on scientific data from pharmacopeias.
- After completing this course successfully, the student is expected to: Be aware of the safety rules in working in the analytical laboratory and what to do if an accident happens acquire the experience in handling and proper usage of laboratory glass wares and different lab equipment. To acquire the skills of identification, interpretation and solving problems results from different instrumental methods of analysis.

Selected Topics in Pharmaceutical Analytical Chemistry and Instrumental Analysis (PHAR 314) (3 credit hours): Pre-requisites PHAR 312

- The purpose of this course is to study several topics in analytical chemistry and instrumental analysis applications especially in pharmacy field. The course includes

understanding concentration units, chemical calculations, quantitative\descriptive analysis, and the statistical analysis of different outcomes.

- After completing this course, the student is expected to: Have the ability to understand the theoretical aspects of these topics and to be able to analyze different results. To have enough knowledge of basic principles of pharmaceutical analytical chemistry and to apply them on different instrumental analysis methods such as separation techniques. To be able to interpret the outcomes based on scientific measures.

Clinical Biochemistry (PHAR 315) (3 Credit Hours): Pre-requisite PHAR 212

- This course aims to study different diseases and their related metabolic and biological disturbances.
- This course includes studying diagnostic methods to evaluate the normal body functions.
- At the end of this course the students are expected to: Understand how different diseases are diagnosed. Be able to use the information and theoretical basics they learned about clinical biochemistry in their life.

Pharmaceutical Technology (PHAR 320)(3 credit hours): Pre-requisite PHAR 220

- This course is a comprehensive study of industrial unit operations used in dosage forms preparation.
- It includes studying unit operations (milling, mixing, drying, filtration, granulation... etc.) of pharmaceutical manufacturing of different dosage forms (tablets, capsules emulsions, suspensions, suppositories, intravenous solutions... etc.). Also, includes studying quality control methods and preformulations, ending up with the best recommended formulations for a certain drug followed by the production.
- Upon successful completion of this course, the student should be able to: Define and understand all the industrial unit operations used in production of pharmaceutical dosage forms. Evaluate the carried-out operations.

Pharmaceutical Technology Lab (PHAR 321) (1 credit hours): Pre-requisite PHAR 320 or concurrent

- The course aims to make the students familiar with pharmaceutical processing of solid raw materials such as milling, drying, mixing, and granulation.
- The course covers practical methods for preparing different types of solid pharmaceutical dosage forms such as tablets and capsules.
- Introduce the pharmacopeia tests for evaluating these dosage forms.
- At the end of this course, the students are expected to: Recognize different solid dosage forms, and to be familiar with the manufacturing processes in any drug factory. Hand-on experience on different instruments and tools that are available.

Principles of Business for pharmacy (PHAR 322) (2 credit hours): Pre-requisite PHAR 332

- This course aims to introduce students to the basic principles of business.
- The course includes the main concepts of marketing, economics, management, accounting, and finance.
- Upon successful completion of this course, students are expected to: Understand theoretical principles of business and their definitions. Recognize their importance and applications in the field of pharmacy.

Pharmaceutical Microbiology (PHAR 330) (3 Credit hours): Pre-requisite PHAR 230

- The course aims to introduce the student to the different branches of microbiology and their pharmaceutical/medical importance.
- The course includes teaching students differentiating various microbes (morphological and through selective staining). In addition, the course includes understanding the relationship between the in-clinic used antibiotics, and their mode of actions. The students explore the microbiological tests for the antibiotics to choose the best course of treatment and understand the development of resistance mechanism within bacteria.
- After completing the course the students are expected to: Give advice on the best choice of antibiotic selection based on the microbial diagnosis Ability to choose the best antibiotic and the most efficient treatment available Understand the genetic factors that lead to the development of antibiotic resistance

Pharmaceutical Microbiology Lab (PHAR 331) (1 Credit hour): Pre-requisite PHAR 330 or concurrent

- The course aims to provide the students with the laboratory skills to test and identify different microbes
- The course includes conducting experiments through safe practice, laboratory sterilization, and sanitization techniques. Evaluate the efficiency of various antimicrobial agents, antiseptic, preservatives, and antibiotics. Besides, the course includes the study of growth cycle, bacterial requirement (nutrients, O2, etc.), and its effect on bacterial growth
- After completing the course the students are expected to: Understand the morphology, function, and the pathogenicity of some selected organisms. Understand the detailed mechanism of the antibacterial and antiviral mode of action. Gain the skills of experimental recording (lab book-keeping) in different formats of lab reports following a scientific journal style.

Pharmacology (1) (PHAR 332) (3 credit hours): Pre-requisite PHAR 231

- The aim of this course is to provide the student with the main pharmacology concepts and an overview to main classes of medications used clinically.
- The following topics will be covered; pharmacokinetics and pharmacodynamics of medications acting on the nervous, cardiovascular, respiratory, and digestive system.
- After completing this course, the student is expected to: Understand the basic principles of pharmacology and drug therapy (including pharmacokinetics and pharmacodynamics). Acquire knowledge about the terms and concepts associated with pharmacology. Demonstrate knowledge about the major classes of medications used clinically. Understand the target, mechanism of action and other properties of these medications.

Pharmacology (2) (PHAR 333) (3 credit hours): Pre-requisite PHAR 332

- This course is a follow-up for pharmacology-1 course (PHAR 332).
- The aim of this course is to introduce the student to the main classes of medications.
- The following medication classes will be covered; renal and circulatory system drugs, drugs used in the management of infectious diseases, antitumor drugs and hormones. The course, also, discusses autacoids and non-steroidal anti-inflammatory drugs (NSAIDs).

- After completing this course, the student is expected to Demonstrate knowledge about the major classes of medications used clinically. Understand the target, mechanism of action and other properties of these medications. Make appropriate decisions for individual patients based on pharmacological knowledge.

Medicinal Chemistry (1) (PHAR 410) (3 credit hours): Pre-requisite: PHAR 333

- This course aims to introduce medicinal chemistry, drugs physiochemical properties & distribution, metabolism, excretion and factors affecting drugs.
- This course includes structure-activity relationships effect on the receptors that gives the biological activities.
- Upon the successful completion of this course, the student expected to: Study in details different drug groups. Understand the drugs that affect central nervous system, autonomic nervous system, circulatory system and diabetes medications. Describe methods of drug development including design and discovery

Medicinal Chemistry (2) (PHAR 411) (2 credit hours): Pre-requisite PHAR 410

- This course aims to continue the detailed studying of drug groups; their mechanism of actions and medical uses.
- This course includes antibacterial, antifungals, antivirals, antiparasites, anticancer, and peptic ulcer drugs. Also, it discusses cardiovascular drugs, non-steroidal anti-inflammatory drugs, and steroidal hormones.
- Upon the successful completion of this course, the student expected to: Synthesis and design different drug groups. Classify and separate different drug groups.

Medicinal Chemistry (2) Lab (PHAR 412) (1 credit hours): Pre-requisite PHAR 411 or concurrent

- This course aims to synthesis several drugs included in theoretical part.
- The experiments include training the students on multi-steps synthesis procedures and methods of evaluations.
- Upon the successful completion of this course, the student is expected to: Use medicinal chemistry principles to synthesize and evaluate some drugs. Acquire practical skills for medicinal drug synthesis

Seminar in Pharmacy (PHAR 413) (1 credit hour): Pre-requisites PHAR 433

- This course aims to familiarize the student with scientific research on a specific topic in the field of pharmacy.
- This course includes selected topics in pharmacy.
- Upon completion of the course the student would be able to: Review, collect, analyze and evaluate scientific published papers related to pharmaceutical sciences. Gain the skills to perform effective presentation.

Biopharmaceutics and Pharmacokinetics (PHAR 420) (3 credit hours): Pre-requisite PHAR 320 + PHAR 212

- This course will study physiochemical and biological factors that affect drug absorption, distribution, metabolism and excretion and its importance in therapeutic or adverse effect of medications.
- This course also addresses medication level calculation in blood or urine based on pharmacokinetic parameters after administering single or multiple doses intravenously or orally.
- In addition, this course discusses after completing this course successfully, the student is expected to: Understand the concept of bioavailability, and factors affecting bioavailability for medications such as onset and extent of drug reaching the blood circulation . Understand the concept of bio-equivalence.

Study Cases in Biopharmaceutics and pharmacokinetics (PHAR421) (1 credit hour): prerequisite PHAR 420 or concurrent

- This course aims to reinforce the different concepts of pharmacokinetics by studying and analyzing different clinical cases.
- This course provides students with a basic intuitive understanding of the pharmacokinetic principles, terminology, models, equations and factors affecting drug absorption, distribution, metabolism and excretion, and its importance in drug therapeutic or toxic effects.
- After completing this course successfully, the student is expected to: Predict the drug plasma concentrations under various conditions by applying the pharmacokinetic

models that best describe the process of drug absorption, distribution and elimination. Handling pharmacokinetic parameters of drugs in the body and solving problem.

Pharamcoepidemiology and pharmacoeconomics (PHAR 422) (2 credit hours): Pre-requisite PHAR 322

- The course aims to provide students with understanding of descriptive and analytical epidemiology for both communicable and non-communicable diseases. The course also addresses disease transition, geographic and demographic distribution of diseases along with their potential determinants.
- This course includes basic concepts and applications of pharmacoeconomics, different methods, and techniques used for evaluating costs and outcomes of healthcare interventions. It also emphasizes the importance of economic evolution, decision analysis and modeling for determination and efficient use of resources. The course also discusses drug pricing policies and control of pharmaceutical expenditure as a part of overall health spending.
- Upon successful completion of this course, students are expected to: Comprehend different types of pharmacoeconomic studies for drug evaluation. Know how to apply principles of epidemiology in pharmacy.

Cosmetic Preparations (PHAR 423) (2 credit hours): pre- requisite PHAR 320

- The course aims to provide the student with the principles of cosmetics (antiperspirants, deodorants, bleaching preparations skin preparations, soaps, sunburn and sunscreen preparations), their formulations, and their use, side effect on the human.
- Also, the course aims to provide the student with knowledge about the analytical methods, efficacy testing of cosmetics and toiletries, microbial control of cosmetics, safety, and stability testing.
- At the end of the course the students are expected to: Differentiate between various analytical methods of the cosmetics, the efficacy testing of cosmetics and toiletries, the microbial control of cosmetics, their safety, and stability testing.

Pharmaceutical Regulatory Affairs and Quality Operations (PHAR 424) (3 Credit hours): Prerequisite PHAR 322

- The course aims to introduce the students to the regulatory and technical issues related to preparing files that will be provided to the pharmaceutical regulatory bodies for registering drugs whether they are new or biosimilars. Also, conducting analytical tests on both types of drugs, pricing, marketing through compliance with local regulations. Also, the student will understand the medical compliance and tools, vitamins and how they are classified and marketed.
- The course includes providing the students with the knowledge, required skills to maintain and execute quality measures during manufacturing drugs and its importance on drug safety.
- After completing the course the students are expected to: The knowledge of how to prepare a quality assurance operation and plan for monitoring, suggesting correction procedure maintain the highest quality levels and the adopted strategies to ensure comprehensive system to guarantee quality products and process. Familiarization with The Association of Clinical Research Organizations (ACROs) and the institutional review boards (IRBs) and how they operate.

Health Policy and Pharmaceutical Regulatory Affairs (PHAR 425) (3 credit hours): Prerequisites: PHAR 440

- This course aims to inform students about principles of checking lists of international guidelines such as European union and the US food and drug administration used in preparing drug registration files for free selling.
- It includes the local and regional medications' pricing reference countries, and studying the basic principles of management, including organizational structure, job description planning.
- At the end of this course the students are expected to: managing personnel in a predetermined time lined good governance, followed by periodic performance evaluation and make corrective measures accordingly.

Pharmaceutical Field Training (PHAR 430) (3 credit hours = 40 effective weekly training hours): Pre-requisites completion of (120) credit hours

- This course aims to introduce the students to different pharmaceutical companies (both national and international), drug stores, and medications available in the market.

- This course involves field training according to a predefined schedule under direct supervision of a faculty member for at least continuous eight weeks in one of the pharmaceutical organizations that dispense medications such as community or governmental/private hospital pharmacy.
- Upon the completion of this course, students will: Gain the knowledge for dispensing prescriptions that are available in Jordan in terms of their scientific and trade names. Understand the clinical uses of medications and important adverse effects. Develop professional communication skills.

Therapeutics (1) (PHAR 431) (3 credit hours): Pre-requisites PHAR 333

- This course aims to describe the pathophysiology, symptoms, goals of therapy, treatment plan, patient monitoring, and patient counseling and education of different diseases.
- The course focuses on the study of cardiovascular, gastrointestinal, endocrine and rheumatic disorders.
- After completing this course the student is expected to: Be able to describe pathophysiology, clinical manifestation, diagnosis, treatment goals, and treatment plan of the disorders covered in this course. Understand the clinical uses, pharmacokinetics and clinically significant side effects, drug interactions and contraindications for the medications described in the course Provide patient education about the disease and medication. Understand the clinical aspects of medication use. Recommend appropriate treatment plan for individual patients.

Therapeutics (2) (PHAR 432) (3 credit hours): Pre-requisite PHAR 431

- This course aims to describe the pathophysiology, symptoms, goals of therapy, treatment plan, patient monitoring, and patient counseling and education of different diseases. Also, students will learn how to contribute in collaboration with the medical team in developing a rational treatment plan, assessment and provision of alternative plan.
- The course focuses on the study of respiratory, central nervous, gynecologic, urologic, dermatologic, infectious, and oncologic disorders.
- After completing this course the student is expected to: Describe pathophysiology, clinical manifestation, diagnosis, treatment goals, treatment plan of the disorders covered in this course. Understand the clinical uses, pharmacokinetics and clinically

significant side effects, drug interactions and contraindications. Provide patient education about the disease and medication. Recommend appropriate treatment plan for individual patients.

Pharmacogenomics (PHAR 433) (2 Credit hours): Prerequisite PHAR 333

- The course aims to introduce the role of genetics on the patient response to the various genetic agents, and the best methods to improve the efficiency and the safety of drugs.
- The course includes introducing the students to the effect of the gene on drug metabolism, and personalized medicine.
- After completing the course the students are expected to: Describe and apply the necessary knowledge in molecular genetics and its relation to genetically inherited disease Capacity to explain the development of the new technologies based on the genetic knowledge and differences between individuals into developing a personalized care plan for the patient based on their genetic makeup.

Pharmaceutical Care (PHAR 434) (3 credit hours): Pre-requisite PHAR 333

- This course aims to outline the role of clinical pharmacist in providing patient-oriented pharmaceutical care.
- This course involves an interactive medical team-based approach. Students participate in monitoring, discussing and evaluating clinical cases in hospitals. In addition to offering patient counseling, students propose evidence-based alternative therapies, based on patients medical histories and treatment.
- By the end of the course, students will be able to: Perceive the concept of pharmaceutical care in a comprehensive way. Achieve excellence in providing pharmaceutical care for patients in public & private hospitals and fulfill their duties as pharmacists in the future.

Non-prescription Drugs (PHAR 435) (2 credit hours): Pre-requisite PHAR 333

- This course aims at increasing the knowledge of non-prescribed products and enables the students to recommend specific non-prescription products for patients, in order to recommend appropriated nonprescription product to proper patients.

- It also includes detailed discussion of acne products, allergy and cough products, anti-emetics, antihistamines, common cold products, contraceptives, hemorrhoids products, laxatives, menstrual disorder products, sleeping aids and vaginal products.
- Upon completing of the course the student is expected to Acquire knowledge of the upper mentioned non-prescription products. Understand patient cases that need to be referred to other healthcare professional. Be able to obtain relevant information about the minor ailment. Recommend appropriated non-prescription product to proper patients. Possess the needed communication skills.

Pharmaceutical Marketing (PHAR 440) (3 credit hours): Pre-requisite PHAR 422

- The aim of this course is to examine the current pharmaceutical marketing environment from both an academic and practical perspectives.
- The course provides an overview of general marketing strategies and principles, and how to apply them to all aspects of marketing pharmaceuticals with a special emphasis on direct-to-consumer advertising.
- Upon successful completion of this course, students are expected to: Develop the necessary knowledge and skills for pharmaceutical promotion and marketing. Understand the scientific knowledge of the drug to be marketed, and acquire the ability to persuade consumers of the advantages of the marketed drug based on scientifically valid information.

Alternatives and Herbal Medicine (PHAR 441) (3 credit hours): Pre-requisite PHAR 310

- The course aims to address registered medicinal plants used in the treatment of various diseases and disorders, especially local plants.
- It focuses on medicinal plants indications, methods, and duration of use, drug interactions and adverse effects.
- This course addresses hallucinogenic and poisonous plants, and their symptoms and treatment.
- After accomplishing this course, the students will be able to: Give counseling to patients regarding medicinal plants and their safe uses. Identify and use different alternative and complementary medicines. Identify hallucinogenic and poisonous plants.

Drug Stability (PHAR 442) (3 credit hours) Pre-requisite PHAR 330

- The course aims to study the physicochemical properties of drug and its ability to withstand different storage conditions.
- The course includes introduction about the kinetic and stability of drug, the accelerated stability of drug, the criteria that regulate the stability of drug, and stability of definite drugs (proteins, liposome). Also deep studies about the stability for some pharmaceutical dosage forms.
- At the end of the course the students will have knowledge about: Define the pharmacokinetics and pharmacodynamics of drugs. Understand the factors that cause the drug decomposition. Calculate the shelf-life of drugs. Do some experiments and studies on the stability of drug.

Pharmaceutical Informatics (PHAR 443) (2 credit hours): Pre-requisite PHAR 431

- This course outlines the integration of emerging information technology and its applications into pharmaceutical practice, with the goal of assuring positive outcomes.
- This course aims to introduce concepts and tools required to understand, apply and develop informatics in pharmacy practice, such as computerized prescribing, electronic disease registries and medical records.
- By the end of the course, students will be able to: Demonstrate skills needed to provide accurate information and patient counseling, with the use of information & communication technology to ensure effective use of medicines. Appreciate the importance of applying new, emerging technology to provide fast, accessible, secured and efficient communication with both the medical team and patients.

Drug Registration and Approval (PHAR 444) (3 credit hours): Pre-requisite PHAR 422

- This course discusses the phases of drugs approval and registration process.
- This course covers the phases of drugs approval process, starting with pre-marketing phase, followed by approval of the marketing plan and post-marketing surveillance, to ensure providing pharmaceutical products with high standards of safety and efficacy.
- By the end of the course, students will be able to: Demonstrate foundational knowledge of drugs registration process. Outline drugs approval phases, before reaching customers.

Pharmaceutical Legislations and Intellectual Property (PHAR 445) (3 credit hours): Prerequisites PHAR 322

- This course aims at introducing the students to knowledge about legislative situation of pharmacy practice and the intellectual properties both locally and internationally.
- It discusses the importance of intellectual property in the pharmaceutical research and development (R&D) issues, patent protection, data and trade mark exclusivity.
- Upon successful completion of this course the student will be able to: Know the principles of intellectual properties locally and internationally. Understand the impact of these principles on the marketing strategies of the Jordanian pharmaceutical industry.

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- Upon successful completion of this course the student will be able to: Know the principles of intellectual properties locally and internationally. Understand the impact of these principles on the marketing strategies of the Jordanian pharmaceutical industry

Communication Skills in Pharmacy (PHAR 446) (2credit hours): Pre-requisite PHAR 440

- The course aims to help the students to gain suitable skills on how to communicate with patients, colleagues and medical stuff.
- The course includes: developing the personal and professional communication skills to provide the appropriate quality health care during their pharmacy practice.
- At the end of the course the students will have knowledge about: The ability to communicate in a professional manner with patients and society. The ability to deal with professional ethics of pharmacy which concern the patient privacy.

Drug Design (PHAR 510) (3 credit hours): Pre-requisite PHAR 411

- This course includes modern drug design focused on computer aided.
- This course aims to develop student's skills of modern drug design and apply them in drug synthesis.
- After completing this course successfully, the student is expected to: Have the ability to Database mining and data analysis approaches. Understand the importance of drug-like models, their prediction, and utilizes all knowledge in future to predict and design new drugs.

Drug Delivery Systems (PHAR 520) (2 credit hours): Pre-requisite PHAR 420

- This course aims at studying the different drug delivery systems (DDS) to human body.

- It includes oral and gastrointestinal DDS, nasal DDS, ophthalmic DDS, pulmonary DDS, rectal and vaginal DDS and transdermal DDS. The course explores the latest technology in this field regarding theory, anatomy, technical elements and applications.
- Upon successful completion of this course, the students should be able to: Define all above-mentioned DDS. Know their anatomy, technical elements and applications.

Pharmacy Accounting and Management (PHAR 521) (3 credit hours): Pre-requisite PHAR 322

- The aim of this course is to study basic principles of accounting, finance, and their applications in the management of pharmaceutical organizations.
- This course introduces accounting and financial programs used for inventory management, procurement, future planning and investment opportunities.
- Upon successful completion of this course, students are expected to: Understand basic principles of accounting. Know the different accounting and financial programs used in health management. Preparation and analysis of key financial data, customer accounts, and budgets in a simplified manner.

Selected Topics in Pharmacy (PHAR 522) (3 credit hours): Pre-requisite PHAR 411

- This course aims to provide in-depth a review of selected topics within the scope of pharmaceutical sciences.
- This course includes a comprehensive discussion of the basic principles of a selected topic, using theoretical and practical approaches.
- By the end of the course, students will be able to: Outline the basic principles in selected topic. Learn, on a regular basis about emerging scientific advances, related to a selected topic.

Advanced Pharmaceutical Technology (PHAR 523) (3 credit hours): Pre-requite PHAR 322

- This course aims at studying the designing principles of: conventional and controlled release tablets, soft and hard gelatin capsules, nontraditional pharmaceutical dosage forms, suspensions, emulsions and inhalers.
- This course includes essentials of nuclear pharmacy, methods of preparing radioactive isotopes and radioactive pharmaceutical formulations and nuclear medicine used in the treatment and diagnosis of diseases. It also addresses physiochemical factors that influence the formulation & stability of these dosage forms.

- Upon successful completion of this course, the student should be able to Define all the above-mentioned dosage forms. Explain their physicochemical properties. Address the methods of evaluation and drugs stability testing. ¬ Define and explain radiopharmaceutical products.

Advanced Pharmacoeconomics (PHAR 524) (3 credit hours): Pre-requite PHAR 523

- This course discusses basic and applied concepts of pharmacoeconomics.
- The course prepares students to design cost effectiveness studies for healthcare interventions in order to inform decision-makers in comprehensive health planning, and efficient use of available resources in providing quality health care service. In addition, the course also introduces applications of technical evaluation and pricing policies for drugs.
- Upon successful completion of this course, students are expected to: ¬ Understand both the theoretical principles and applications of pharmacoeconomics. ¬ Present, analyze and critique an international pharmacoeconomic study and its relevance and application in Jordan.

Clinical Therapeutics (2)(PHAR 530) (3 credit hours): Pre-requisite PHAR 432

- This course aims to outline the role of clinical pharmacist, pharmaceutical treatment, therapeutic plans for many diseases and clinical problem - solving skills.
- The course covers the professional responsibilities of clinical pharmacist, pharmaceutical therapeutics, a review of many clinical cases and the principles of providing pharmaceutical information & patient counseling,
- By the end of the course, students will be able to: Develop skills needed to provide pharmaceutical information & patient counseling. Develop effective communication skills. Develop the ability of recommending appropriate pharmaceutical therapeutics for diseases. Develop clinical problem- solving skills.

Advanced Pharmaceutical Biotechnology (PHAR 531) (2 Credit hours): Pre-requisite PHAR 540

- The course aims to provide information about recombinant DNA (rDNA) and it is applications in the pharmaceutical sector.

- The course includes the formulation, synthesis, and design of biological therapeutics, purification of proteins, vaccine, immunogenicity and the challenges of working in biotechnology companies including the ethical and regulatory affairs.
- After completing the course the students are expected to: Understand the basics of pharmaceutical biotechnology. Understand the impact of pharmaceutical biotechnology in the development of new therapeutics for emerging diseases.

Toxicology (PHAR 532) (3 credit hours): Pre-requisites PHAR 333

- This course aims to study the basic principles of toxicology and its clinical applications.
- This course includes study of the fundamental principles of toxicology, the pathophysiology of different toxins, manifestations and the possible treatment. Also, this course will cover good knowledge about the source, nature, exposure, dose and the possible treatment of toxic substances.
- Upon completion of this course, the student will be able to: Discuss comprehension of basic principle of toxicology. Evaluate the clinical manifestations that result from intoxication. Provide a first aid help for the intoxicated victim. Differentiate between the major mechanisms of action of a specific toxicant.

Immunology and Vaccines (PHAR533) (2 credit hours): Pre-requisites PHAR 330 +PHAR 333

- This course aims to introduce the pharmacy students to the basic principles of immunology, immunological diseases, and vaccines.
- The course includes a discussion of innate and adaptive immunity.
- Upon completion of this course the students are expected to: Understand the basic principles of immunology. Distinguish between various types of vaccines and their medical applications.

Pharmaceutical Biotechnology (PHAR 540) (3 Credit hours): Pre-requisite PHAR 330

- The course aims to provide the students with the essential background knowledge in biotechnology with emphasis on pharmaceutical applications.
- The course includes the core topics of introducing the biotechnology field, genes, gene selection, vectors (plasmids), viral-based vectors, gene isolation, gene expression, cloning, protein therapeutics, and biotechnology roles in drug development.

- After completing the course the students are expected to: Understanding the basic principles of biotechnology and its applications. Gain analytical knowledge in pharmaceutical biotechnology.

Research and Development in Pharmacy (PHAR 541) (3 credit hours): Pre-requisite PHAR 420

- This course aims at studying research methods of the main scientific stages for production and developing a drug formula, followed by manufacturing, evaluation and conducting stability studies ending up with drugs approved by quality control and assurance.
- This course includes: the concepts of good manufacturing practice labs (GMP) for pharmaceutical products, their general principles and requirements according to the international standards including in-process validation and production step wise inspection in order to obtain a high-quality product.
- Upon successful completion of this course, the learner should be able to: Analyze the stages of developing a drug formula and manufacturing, evaluation and conducting stability studies of these formulas. Explore GMP principles according to international standards and validation

Ethics and Legislations in Pharmacy (PHAR 542) (2 credit hours): Pre-requisite PHAR 322

- The course aims to study the Jordanian law of drug and pharmaceuticals, and the special legislations of the pharmacy practice profession in Jordan.
- The course includes the intellectual property principles and its applications locally and internationally in the pharmaceutical manufacturing. Also, it discusses the importance of the intellectual property in the research and development, the patent protection, and exclusive commercial and public date.
- At the end of the course the students will have knowledge about: The understanding of the intellectual property and its effect on the strategy of the marketing in the Jordanian drug manufacturing. A good knowledge of the Jordanian drug law. Awareness in the special legislations of the pharmacy practice in Jordan

Health Services Marketing (PHAR 543) (2 credit hours): Pre-requisite PHAR 440

- This course aims to introduce basic concepts of marketing services and international marketing.
- The course introduces students to health services marketing strategies applied in different health organizations including private and public hospitals, and primary healthcare centers.
- Upon successful completion of this course, students are expected to: Know basic principles for marketing of health services. Prepare health services marketing plans to promote health care for patients and to provide quality care for them