

# Pharm D Program (Clinical Pharmacy)

## **PC 101 Pharmaceutical Analytical Chemistry I (2+1)**

Chemical Kinetics, rate of reaction, first order reaction, rate law, second order and third order of reaction, molecularity, Theories of reaction rate, activation energy and catalysis, Photochemistry, absorbed energy and quantum yield. Introduction to qualitative and quantitative inorganic chemistry, acid-base theory, titration curve and buffer solutions. Precipitometry factors affecting precipitate formation and pharmaceutical application.

## **PC 102 Pharmaceutical Organic Chemistry I (2+1)**

The objective of this course is to provide students with the basic knowledge in pharmaceutical organic chemistry, which will serve as fundamentals for other courses offered during subsequent semesters. This course involves Electronic structure of atom, alkanes [nomenclature, synthesis and reactions (free radical reactions)], and cycloalkanes. Stereochemistry (Optical isomers, racemic modification, nomenclature of configurations). Alkenes, alkadienes and alkynes. Alkyl halides (nomenclature, preparation and chemical reactions (S N 1, S N 2, E 1, E 2)). Arenes and aromatic compounds (Kekule structure, Huckel rule, Electrophilic aromatic substitution and orientation).

## **PC 203 Pharmaceutical Analytical Chemistry II (2+1)**

Complexometric titrations and oxidation-reduction titrations (electrical properties of redox systems, Nernst equation factors affecting oxidation potential, redox titration curves, pharmaceutical application on redox reaction), Electrochemistry (potentiometry, conductometry; and polarography).

## **PC 204 Pharmaceutical Organic Chemistry II (2+1)**

This course involves different classes of organic compounds: aryl halides, Alcohols, Phenols, ethers & epoxides, aldehydes, ketones, carboxylic acid & acid derivatives, sulphonic acids, and nitrogenous compounds.

## **PC 305 Pharmaceutical Organic Chemistry III (2+1)**

This course involves: carbohydrates, amino acid & peptides, polynuclear and heterocyclic chemistry. In addition, it provides an introduction about the use of different spectroscopic tools, including UV, infrared (IR), nuclear magnetic resonance (NMR) and mass spectrometry (MS) for the structural elucidation of organic compounds.

## **PC 706 Medicinal Chemistry I (2+1)**

This course is tailored to assist the students to gain the drugs affecting the autonomic nervous system (ANS), drugs acting on the cardiovascular system (CVS), CNS. The course handles different classes of antibiotics and antimicrobials (natural and synthetic), beside other synthetic chemotherapeutic agents (including antivirals, antifungals and antiparasitics). Additionally, various anticancer therapies, steroidal hormones and related drugs are also covered.

### **PC 707 Quality Control of Pharmaceuticals (2+1)**

The course is shared with departments: Microbiology & Chemistry:

1) Quality control & quality assurance of pharmaceuticals.

The course has to be designed for quality control microbiology professionals, quality assurance or regulatory affairs personnel who have responsibility for the performance of Bioburden, Endotoxin & Sterility Testing or for data review, pharmacists performing sterile compounding. Principles, methods and procedures of different quality control tests used for evaluation of safety, potency and palatability of pharmaceutical products of small and large molecules drugs (biologicals) including herbal drugs have to be taught. The standard pharmacopeial methods and procedures as well as international guidelines as WHO, EMA, TGA should be discussed.

2) Good Analytical Practice and Sampling: Introduction, Sampling of pharmaceuticals and related materials, Type of sampling tools, Sampling plans.

3) Documentation.

4) Validation of analytical methods according to ICH Guidelines Q2 R1. Compendial testing, Validation of analytical methods, Data elements required for assay validation.

5) Drug stability, stability studies and stability indicating methods Drug stability, Stability testing, forced degradation studies, stability indicating assay methods for drugs according to ICH Q1 R2 Guidelines. Stress conditions for drug degradation according to ICH Q1 R2 Guidelines. Factors affecting drug degradation, Drug expiration, Drug withdrawal from the market. Pharmaceutical regulations according to FDA & EMA (European medicine agency) and ISO and BSI. Drug-excipient interactions and adduct formation; analytical techniques used to detect drug-excipient compatibility, mechanism of drug-excipient interactions, examples.

6) Official methods of analysis applied to raw materials and end products.

### **PC 808 Medicinal Chemistry II (2+1)**

The course is tailored to assist the students to gain the drugs affecting neurodegenerative disorders. Moreover, endocrine-related drugs (Diabetes, thyroid and calcium-regulating agents), antihistamines (H1, H2 blockers and anti-ulcer PPIs), drugs controlling pain and inflammation (NSAIDs, local anaesthetics and rheumatoid drugs) are also handled.

### **PB 201 Cell Biology (1+1)**

The course aims at studying the structure and function of prokaryotic and eukaryotic cells. In this course study will include many different areas of cellular biology involving: the synthesis and function of macromolecules such as DNA, RNA, and proteins; control of gene expression; membrane and organelle structure and function; bioenergetics; and cellular communication, transformation; transport, receptors, and cell signaling; the cytoskeleton, the extracellular matrix, and cell movements.

### **PB 302 Biochemistry I (2+1)**

Structure of proteins, Biologically active peptides, Protein turnover, Amino acids as precursors for biosynthesis of biomolecules (e.g. neurotransmitters, nucleotides), Structurally and physiologically important lipids, Lipoprotein metabolism, Carbohydrates and connective tissue, Enzymes (theories of enzyme action, enzyme kinetics, inhibition and regulation of enzyme activity, clinical correlations), ATP synthesis from reduced metabolites (electron transport chain, inhibitors, uncouplers), Hemoglobin and myoglobin (structure, synthesis and metabolism, clinical correlations).

### **PB 403 Biochemistry II (2+1)**

Mobilization of body stores of glycogen and fats -Metabolism and tissue utilization of glucose, amino acids, and fatty acids – Regulation of blood glucose level and clinical correlations – Feed/fast cycle – Nitrogen metabolism and nitrogen balance – Inborn errors of metabolism – Second messengers and signal transduction – Biochemistry of cancer - Biochemistry of aging – Food biochemistry (milk – probiotics) – Oxidative stress and body defense mechanisms.

### **PB 804 Clinical Biochemistry (2+1)**

Organ function and laboratory diagnostic tests (liver, kidney, heart, pancreas, bone), Plasma proteins and albumin/globulin ratio, Types and lab differentiation of hyperlipidemia, Examples of different diseases (case study, interpretation of analytical data), Handling, preservation, storage and analysis of biological samples, Abnormalities of urine analysis, Blood analysis and complete blood count, Tumor markers, Endocrinology (classification of hormones, mechanisms of action, dysfunction), Electrolytes, blood gases and acid-base balance, Recent diagnostic biomarkers.

### **PB 905 Clinical Nutrition (1+1)**

Measures of healthy life-style, Macronutrients and calculation of calories, Basal metabolic rate (BMR), Recommended daily allowance (RDA), Nutritional requirement for pediatrics and geriatrics, Vitamins and minerals (role in metabolism, clinical significance), Gut microbiota and human health, Enteral and parenteral nutrition, Dietary care for patients with obesity, diabetes mellitus, cardiovascular, renal and hepatic disorders. Dietary care for cancer patients, Dietary care for sports men, Dietary care for pregnant and lactating women, Nutrigenomics.

### **PT 101 Pharmacy Orientation (1+0)**

This is a course to acquaint the beginning pharmacy student with the multiple aspects of the profession of pharmacy including the mission of pharmacy, role of pharmacist in society and pharmacy careers, classification of medications, interpretation of prescriptions and medication orders, general dispensing procedure and factors affecting drug dosage, sources of drugs, different dosage forms and various routes of administration. In addition to the history of pharmacy practice in various civilizations.

### **PT 202 Physical Pharmacy (2+1)**

This course provides students with knowledge of physical and chemical principles essential for the design and formulation of pharmaceutical products. Students are introduced to the fundamental concepts of states of matter, Phase equilibrium, colligative properties, isotonicity solubility, dissolution, partition coefficient, surface and interfacial phenomena, surface active agents, adsorption and its application in pharmacy and rheological behaviour of dosage forms.

### **PT 303 Pharmaceutical Dosage Forms I (2+1)**

This course is a study of the system of weights, measures, mathematical expertise and pharmaceutical calculations requisite to the compounding, dispensing, and utilization of drugs in pharmacy practice. It is also concerned with all manufacturing formulations aspects, packaging, storage and stability of liquid dosage forms including solutions (aqueous and non-aqueous), suspensions, emulsions and colloids with emphasis on the technology and pharmaceutical rationale fundamental to their design and development. The incompatibilities occurring during dispensing are also considered.

### **PT 404 Pharmaceutical Dosage Forms II (2+1)**

This course covers the structure and function of the skin, target area of treatment after topical application to skin, basic principles of diffusion through membranes and factors affecting percutaneous absorption, enhancement of skin penetration, transdermal drug delivery systems (TDDS). It also describes the principles and techniques involved in the formulation and manufacturing of traditional dermatological semisolid dosage forms (creams, ointments, gels and pastes) and cosmetic products.

### **PT 505 Pharmaceutical Dosage Forms III (2+1)**

The course introduces the students to the kinetics of drug decomposition including rate and order of the reaction, determination of the half-life, expiry date and shelf-life by different methods, stability testing, and in-vitro possible drug/excipients interactions. It also describes the principles and techniques involved in the formulation, and manufacturing of solid dosage forms including powders, granules, tablets, capsules and suppositories.

### **PT 606 Pharmaceutical Technology (2+1)**

The course provides students with an introduction to industrial pharmacy. It deals with the principles of various unit operations such as heat transfer, evaporation, drying, distillation, filtration, centrifugation, crystallization, extraction, size reduction, size separation, size analysis and size enlargement. It focuses on the application of these unit operations in pharmaceutical industry with emphasis on the equipment and machines used during the production of different dosage forms.

#### **PT 707 Advanced Drug Delivery Systems (2+0)**

A continued study of pharmaceutical dosage forms with emphasis on novel and targeted drug delivery systems. Discussions focusing on transforming proteins, genes, and other biotechnology driven compounds into therapeutic products including the role of molecular modeling and new drug therapies in fabricating rational drug delivery systems are included. The course covers targeted nanocarrier-based delivery Systems and other advanced therapy medicinal products such as gene therapy medicinal products (GTMPs), somatic cell therapy medicinal products (sCTMPs), and tissue-engineered products (TEPs). In addition to formulation aspects of biotechnology derived pharmaceuticals, it also covers the application of polymers and excipients to solve problems/issues concerning the optimization of absorption, selective transport, and targeting.

#### **PT 708 Biopharmaceutics and Pharmacokinetics (2+1)**

The course is concerned with the exploration and examination of the physicochemical properties of drugs in the physiological environment and their impact on product performance. It explores the principles of biopharmaceutics and strategies for enhancing drug delivery and bioavailability. Also, it introduces the students to basic pharmacokinetic parameters and mathematical aspects. General principles of pharmacokinetic models are presented as they pertain to the process of absorption, distribution and elimination of drugs in humans and the significance of these processes in drug therapy. Topics also emphasize linear and nonlinear metabolic clearance kinetics, drug-drug interaction mechanisms and kinetics, in vitro-in vivo predictions, pharmacogenetics and other sources of inter-individual variability.

#### **PG 101 Medicinal Plants (2+1)**

The aim of the course is to provide students with knowledge necessary to identify and prepare a crude drug from the farm to the firm. Students should acquire knowledge concerning dusting powders, plant cytology, physiology and medicinal leafy plants. In this course, the student will study: importance of natural products, preparation of natural products-derived drugs including collection, storage, preservation and adulteration. The course will introduce the students to the different classes of secondary metabolites. In addition, the course will discuss and address the variability in occurrence of pharmacologically active substances in certain official medicinal leafy plants according to their WHO monographs.

#### **PG 202 Pharmacognosy I (2+1)**

Based on the Egyptian flora and other floras of wild and cultivated medicinal plants that are used in the pharmaceutical, cosmetic and food industries in the global & Egyptian market. The course introduces students to some botanical drugs of leaves, flower, seeds, bark and wood origin. During

the lectures and practical sessions, students learn to identify examples of these drugs in their entire and powdered forms. Student will learn about the major constituents, folk uses, clinically proven uses, benefits, precautions of those medicinal plants. Possible herbal-drug interactions of selected examples of these drugs.

### **PG 303 Pharmacognosy II (2+1)**

Based on the Egyptian flora and other floras of wild and cultivated medicinal plants that are used in the pharmaceutical, cosmetic and food industries in the global & Egyptian market. The course introduces students to some botanical drugs of, fruits, subterreans, herbs, unorganized drugs of marine and animal origin. During the lectures and practical sessions, students learn to identify examples of these drugs in their entire and powdered forms. Student will learn about the major constituents, folk uses, clinically proven uses, benefits, precautions of those medicinal plants. Possible herbal-drug interactions of selected examples of these drugs.

### **PG 504 Phytochemistry I (2+1)**

Based on complementary medicine and Egyptian medicinal plants that can be used as natural extracts, bioactive raw materials and phytochemical standards to serve the pharmaceuticals, cosmetics and food industries in Egypt. The course aims to gain the students the knowledge and experience those enable them to understand, describe and deal with the chemistry of tannins, resins and resin combinations, carbohydrates, glycosides, and bitters of plant or animals as well as techniques for their, isolation, identification and determination from their respective sources. Clinical applications will be correlated with various clinical analyses.

### **PG 605 Phytochemistry II (2+1)**

The course aims to enable students to demonstrate knowledge of basic concepts of chemistry and bioactivities of alkaloids, volatile oils and antioxidants as well as chromatographic techniques for their isolation and identification. The course emphasizes on drugs with valuable use in the Egyptian and worldwide markets, such as anti-cancer agents, drugs affecting CNS, drugs ameliorating liver diseases and anti-inflammatory agents. Finally, the course focuses on the structure activity relationships (SAR) of these natural products derived compounds and their pharmacophoric features. Clinical applications will be correlated with various clinical analyses.

### **PG 906 Phytotherapy (2+1)**

The course aims to enable students to attain the systematic approach for herbal prescribing through a comparative study of both traditional and scientifically based uses of herbal drugs in the treatment of various clinical disorders. The course provides clinical pharmacy students with review of the available information on how botanicals may normalize an altered function. Approval by World Health Organization (WHO), German Federal Institute for Drugs and Medical Devices

(Commission E) is the base for selection of the studied herbs. The herbal drugs treated in combined way relative to pharmacognosy, pharmacology and toxicology. Special concern is given to the possible mode of action of the herbal drugs based on experimental and clinical pharmacological studies. Also, the student should understand the basis of complementary and alternative medicine with emphasis on herbal remedies, nutritional supplements, homeopathies, aromatherapy & their effect on maintaining optimum health and prevention of chronic diseases.

#### **PM 401 General Microbiology and Immunology (2+1)**

The course provides students with a combination of laboratory and theoretical experience exploring the general aspects of microbiology. It includes knowledge of microorganisms, their morphology, diversity, cell structure and function, cultural characteristics, growth, metabolism, role of microorganisms in infectious diseases and microbial pathogenesis. It also clarifies different mechanisms of transport across bacterial cell membrane, metabolic pathways and physiology of bacteria. The course also covers the principles of genetic characters including DNA and RNA structures, replication, different forms of mutation and mutagenic agents. It also explores the basic concepts microbial growth, cultivation and reproduction. Moreover, it introduces the modern concepts of medical immunology, with an emphasis on Host parasite relationship, Non-specific and specific immunity, Mechanism of protective immunity. Molecular and cellular immunology, including antigen and antibody structure, function and reaction between them, effector mechanisms, complement, and cell mediated immunity. Active and passive immunization. Hypersensitivity and in vitro antigen antibody reactions, Immuno-deficiency disorders, Autoimmunity and auto-immune disease, organ transplantation.

#### **PM 502 Pharmaceutical Microbiology and Antimicrobials (2+1)**

This course is designed to provide student with basic, practical and professional knowledge on antimicrobial agents, either antibiotics or non-antibiotics. Different sterilization methods and their application scope will be studied in this course.

#### **PM 503 Parasitology and Virology (2+1)**

This course will focus on parasitic infections of humans with knowledge concerning biological, epidemiological and ecological aspects of parasites causing diseases to humans. It concerns with different parasitological related diseases in in Egypt causing serious health problems. This part of the course will discuss medical helminthology, protozoology and entomology concerning their morphological features, life cycle, pathogenesis, clinical manifestations, different diagnostic techniques, the most recent lines of treatment and prevention with control strategy for each parasitic infection. Moreover, it also cover laboratory diagnosis of human parasitic infections. The other part of the course provides students with the essential knowledge to recognize the epidemiology, mechanisms of pathogenesis, clinical picture, methods of laboratory diagnosis, treatment, prevention and control measures of RNA and DNA viral infections in humans.

#### **PM 704 Medical Microbiology (2+1)**

To educate students about the basic features of general bacteriology, virology and mycology. To familiarize students with the common infections and diseases of medical importance, their microbial causes, as well as laboratory diagnosis, treatment, prevention and control of such diseases.

### **PM 805 Public Health and Preventive medicine (2+0)**

The course introduces students to the global public health and the Sustainable Development Goals (SDGs). It also includes the fundamentals of epidemiology, communicable and non-communicable diseases and their control with special emphasis on antibiotic resistance and antibiotic stewardship as well as emerging pathogens. The course also covers nutritional health, occupational medicine and women's, children's and adolescent's health and the relationship between the environment and public health. It is anticipated that students will achieve an understanding of the optimal environmental conditions for improved public health such as air, food and water purity and sanitary water disposal. The ability to understand and evaluate the biological and chemical basis for health threats emanating from the environment is also gained.

### **PM 906 Biotechnology (2+1)**

The biotechnology subject is crucial for pharmacy students. It mainly aims to provide sufficient foundation for the student on how to learn the concept of the biotechnology, its main components, optimization of fermentation, bioconversion biodegradation and bioremediation – gene therapy and genetic engineering. It simply puts the student on the track of the hot topic and the coming near future of the pharmaceutical industries.

### **MD 101 Medical Terminology (1+0)**

To ensure that the students have the necessary competency enabling them to recognize, analyze, synthesize, and apply medical terms as well as universally approved abbreviations related to the health profession, medical and paramedical. This course deals with basic components of medical terms (roots, prefixes, suffixes, and linking or combining vowels) and how does the medical terminology work by combining these basic components. The course also includes commonly used prefixes, and roots of body system, as well as the commonly used medical abbreviations.

### **MD 202 Anatomy and Histology (2+1)**

The aim of the course is to provide the students with competency concerning the appropriate functions of cells, tissues, organs and body system. The course also enables the student to integrate physiological data and mechanisms with ongoing taught sciences: anatomy and histology. Histology part includes cytology, epithelium, C.T., blood, muscle, vascular, lymphatic, respiratory, gastrointestinal and endocrine systems. Anatomy part includes introduction to human anatomy, tissues of

the body, skeletal system, articular system, muscular system, digestive system, cardiovascular, respiratory system, lymphatic system, urinary system, genital system, nervous and endocrine systems.

### **MD 203 Psychology (1+0)**

The course introduces different principles, theories and vocabulary of psychology as a science. The course also aims to provide students with basic concepts of social psychology, medical sociology and interpersonal communication which relate to the pharmacy practice system that involves patients, pharmacists, physicians, nurses and other health care professionals.

### **MD 304 Physiology and Pathophysiology (2+1)**

To ensure that the students have the necessary knowledge & skills enabling them to develop professional competency in the recognition & discussion of different physiological and Pathophysiology aspects of the major body organs and system pertinent to this course and in the application of such competencies in the specialist areas. This course covers the physiological function of different organs including physiology of body fluids, blood, nerve and muscle, central nervous system, special senses, autonomic nervous system, defense mechanisms. Physiology of cardiovascular, respiratory, excretory, endocrine and digestive systems; organic and energy metabolism; exercise and environmental stress are also included. The basic concepts of pathophysiology at the cellular level related to injury, the self-defense mechanism, mutation, and cellular proliferation, and the pathological factors that influence the disease process. Clinical manifestations associated with the diseased organ(s).

### **MD 405 Pathology (1+0)**

The study of biochemical, structural and functional changes in cells, tissues and organs, which are caused by diseases.

### **MD 606 First Aid and Basic Life Support (BLS) (1+1)**

After completing the course, the student should be able to know how to deal with medical emergency based on the different courses. It includes: introduction & accidents, first aid ABCs, medical emergencies, effect of temperature, transportation of an injured casualty & first aid kit, respiratory emergencies, fractures and dislocations, bleeding and surgical emergencies, burns and scalds, animal bites or stings and poisoning.

### **PO 301 Basic Pharmacology (2+0)**

This course provides the principles underlying the actions of drugs; including pharmacokinetics, drug-receptor interactions, and drug metabolism. It explores the fundamental mechanism of drug action emphasizing the modulation of interactions between endogenous ligands and targets. Key target types include receptors, enzymes, transporter proteins, ion channels and nucleic acids. Key concepts include enzyme action, regulation, inhibition and signal transduction. In addition, the course

provides the basic principles of drug absorption, distribution, metabolism and excretion. Also, integrates principles of autonomic system.

#### **PO 402 Pharmacology I (2+1)**

This course integrates principles of pharmacology with conceptual knowledge of physiology and pathophysiology to disease processes regarding the neuromuscular, autacoids, anti-inflammatory and cardiovascular systems.

#### **PO 503 Pharmacology II (2+1)**

This course integrates principles of pharmacology with conceptual knowledge of physiology and pathophysiology disease processes regarding drugs acting on central nervous system, gastro-intestinal and pulmonary systems. The analgesics as well as gout treatments are also within the scope of the course.

#### **PO 604 Pharmacology III (2+0)**

This course integrates principles of pharmacology with conceptual knowledge of physiology and pathophysiology disease processes regarding drugs acting on endocrine system. Chemotherapeutic drugs including antimicrobials, anticancer and immunosuppressant are within the scope of the course. Stem cell therapy is also included.

#### **PO 905 Basic and clinical Toxicology (2+1)**

To ensure that the students have the necessary knowledge & skills, as well as comprehensive understanding of the basics of toxicology enabling them to have detailed knowledge and to develop professional competence in the recognition, solving, and discussion of different toxicological cases. It includes: basics and concepts of toxicology including the mechanism of toxicity, target organ and treatment of toxicity. Toxic groups including heavy metals, toxic gases, animal, plant and marine poisons, pesticides and radiation hazards are covered. Environmental, occupational, reproductive and genetic toxicology as well as drug abuse are included. Postmortem sampling for detection of poisons, methods of detection, interpretation of results and writing of a report are also covered.

#### **PP 501 Community Pharmacy Practice (2+1)**

This course includes the study of the clinical situations that can be handled by the pharmacist in the community pharmacy (referral or using OTC medications) including upper respiratory tract, gastrointestinal, and musculoskeletal symptoms, skin, eyes, and ears, and childhood symptoms.

### **PP 602 Hospital Pharmacy (2+1)**

Organization and structure of a hospital pharmacy, hospital pharmacy facilities and services (inpatient and outpatient services), transfer of care, patient's medication record, and rational medication use, hospital formulary, pharmacy and therapeutic committee, I.V. admixtures and incompatibilities, parenteral nutrition, handling of cytotoxic drugs, therapeutic drug monitoring, patient counselling and safety, and risk management.

### **PP 603 Clinical Pharmacy Practice (2+1)**

This course includes the definition and concepts of clinical pharmacy and pharmaceutical care, case history and case presentation, medication history taking, clinical problem solving, and therapeutic planning, clinical rounding and assessment of patient compliance. Principles of special care populations (geriatric, pediatric, pregnancy, and lactation). Drug-related problems and drug interactions. Interpretation of clinical laboratory data and physical examination.

### **PP 704 Drug information (1+1)**

This course includes an advanced application of the science of drug information in terms of: its practice within the drug information centers and various clinical sites. The course will focus on Drug information and poison information centers, different drug information resources, use of the internet for drug and research information, evaluating information on the web. The classification of study design and clinical trials, data presentation, and basic statistical concepts are detailed. Basics of pharmaco-economic literature are described.

### **PP 805 Management of Endocrine and Renal Diseases (2+1)**

This course includes the Pathophysiology, causes, clinical presentation, diagnosis and application of pharmaceutical care plans in different endocrinologic disorders (Diabetes, thyroid disorder, Cushing syndrome) and different renal disorders and related fluid and electrolyte disturbances (acute and chronic renal failure, uremic syndrome, kidney stones). The course develops the students' ability to design, monitor, refine safe and cost-effective treatment plans and provide appropriate information to patient, caregivers, and health professionals.

### **PP 806 Management of Cardiovascular Diseases (2+1)**

Main diseases affecting the cardiovascular system, symptoms, prognosis, pharmacological and non-pharmacological management, patient counseling and monitoring of dyslipidaemias, hypertension, coronary artery disease, acute coronary syndromes, heart failure, dysrhythmias, thromboembolic disorders, and stroke.

### **PP 807 Clinical Pharmacokinetics (2+1)**

Introduction to clinical pharmacokinetics and its applications, pharmacokinetics, non-compartmental pharmacokinetics and moment analysis. Drug distribution and drug clearance mechanisms, IV infusion kinetics and kinetics following extra-vascular dosing, metabolite kinetics, multiple dose kinetics, non-linear pharmacokinetics, dosage regimen design, dosage individualization of drugs of narrow therapeutic index especially in patients with compromised renal and hepatic function.

### **PP 908 Management of Gastrointestinal Diseases (2+1)**

Hepatic disorders including viral hepatitis, pancreatitis, gastrointestinal bleeding, peptic ulcer, gastro-esophageal reflux disease, inflammatory bowel diseases and irritable bowel syndrome as well as gastrointestinal symptoms including nausea, vomiting, constipation, and diarrhea.

### **PP 009 Management of Critical Care Patients (1+1)**

This course aims to provide the student with the knowledge in, pathophysiology, clinical interpretation, pharmacotherapy and management of critical care illness (e.g. medical and surgical crises, trauma patients, supportive care, ICU infections, burns, neuro-critical care, cardiovascular critical care, sepsis, septic shock, pain and analgesia, bleeding disorders and anticoagulation, nutritional support and therapy, hemodynamic monitoring, fluid and electrolyte disorders).

### **PP 010 Management of Dermatological, Reproductive and Musculoskeletal Diseases (2+1)**

Skin structure and function, primary and secondary lesions. Most popular skin diseases: infective and non-infective types and their differentiation. Sexually transmitted diseases, male infertility, and women health. Musculoskeletal disorders are also included.

### **PP 011 Management of Pediatric Diseases (2+1)**

Nutritional requirements in neonates and infants, nutritional disorders, neonatology, infectious diseases in pediatrics, congenital heart diseases, endocrine, neurological, haematologic, renal, and respiratory disorders, pediatric emergencies.

### **PP 012 Management of Oncological Diseases and Radio Pharmacy (2+1)**

Cancer aetiology, risk factors, cancer staging and grading, diagnosis, prognosis, optimizing chemotherapeutic regimens, different types of tumours (solid and hematologic) and their management, toxicities of chemotherapy, supportive treatment, pharmaceutical care and patient's support measures. This course also includes studying radioactive isotopes which process medical applications and precautions of their usage.

### **PP 013 Management of Neuropsychiatry Diseases (2+1)**

This course aims to provide the student with the knowledge in, pathophysiology, clinical interpretation, pharmacotherapy and management of neuropsychiatric diseases (e.g mental health disorders, schizophrenia, depression, anxiety, seizure disorders, parkinsonism, migraines, dementia and Alzheimer's disease). Sedative and hypnotics, general anesthetics, opioid analgesics and nonsteroidal anti-inflammatory drugs.

### **PP 014 Management of Respiratory Diseases (1+1)**

Epidemiology, etiology, pathophysiology, clinical manifestation, investigations, treatment, monitoring, and patient counseling of bronchial asthma, chronic obstructive pulmonary disease, pulmonary hypertension, cystic fibrosis, upper and lower respiratory tract infections, and drug-induced respiratory problems.

### **PP 015 Clinical Research and Pharmacovigilance (1+1)**

This course introduces the student to the basic principles of clinical research, design of research studies, types of research studies, clinical trials, statistical presentation of research data and ethical guidelines in drug research. This course also provides the students with understanding of pharmacovigilance importance, concept, processes, systems, global safety standards and regulations and reporting systems.

### **MS 101 Mathematics (1+0)**

This course provides an essential guide to the mathematical concepts, techniques, and calculations, a student in the pharmaceutical sciences is likely to encounter. It includes definition of Number, Variable, Function, composition of functions, different types of functions. Definition of Limits of one variable functions, continuity, differentiability and applications of these concepts. Definition of the definite and indefinite integrals. The fundamental theorem of calculus and applications of definite integral. Determined the area arc length, volumes and surfaces of revolutions Differentiation and integrations of exponential, logarithmic, trigonometric and transcendental functions. Techniques of integrations, trigonometric and transcendental functions. Techniques of integrations. Matrix Algebra and system of linear equations.

### **NP 101 Information Technology (1+1)**

This course tends to provide students with a brief introduction to the world of computers and the concept of information technology including: number systems and data representation, computer system components: hardware & software, storage and input/output systems, Operating systems and Utility Systems, software applications. Also, it gives an overview about computer networks and internet: data communication, transmission modes, transmission media, computer networks, internet protocol,

and internet services. It practices some computer applications in the laboratory such as Internet Access, word processing and power point. It gives students a practical experience on developing projects related to the specialty.

### **NP 102 Human Rights and Fighting Corruption (1+0)**

يغطي هذا المقرر الموضوعات التالية: حقوق الانسان في القانون الجنائي، حق الانسان في تغيير جنسيته او التحلي عن احدي جنسياته، المواثيق الدولية المتعلقة بحماية حقوق الانسان، علاقة العولمة و التنمية بالحقوق الاقتصادية و الاجتماعية و الثقافية، الحقوق الاقتصادية و الاجتماعية و الثقافية للانسان، حقوق الانسان في الشريعة الاسلامية، حقوق المرأة في قانوني العمل و التأمين الاجتماعي، حقوق الانسان في التقاضي، الحقوق المدنية و السياسية للانسان.

### **NP 403 Scientific Writing and Communication Skills (1+1)**

This course is designed to introduce students to the principles of good scientific writing, to be familiar with basic structure of scientific reports and research articles. It covers methods of paraphrasing, common mistakes in scientific writing, different writing styles, how to write a scientific report, proposal and manuscript, appropriate use of tables and figures in data presentation and evaluation of literature and information sources. In addition, it will help students develop necessary written and oral communication and presentation skills to improve inter- and intra-professional collaboration and communication with patients and other health care providers. The course will also deal with the underlying attitudes, which form an interpersonal skill. It focuses on concept and meaning of communication; verbal and non-verbal communication (body and vocal language); active listening skills; communication styles and presentation skills. Communication skills in diverse pharmacy practice setting will be discussed.

### **NP 404 Pharmaceutical Legislation and Practice Ethics (1+0)**

A detailed presentation of law that governs and affects the practice of pharmacy, legal principles for non-controlled and controlled prescriptions, OTC drug requirements, opening new pharmacies, opening medical stores, opening factories, opening scientific offices, medicine registration, pharmacies and medicine stores management. Pharmacist duties and responsibilities, pharmacist-patient relationship, patient's rights and ethical principles and moral rules.

### **NP 905 Marketing and Pharmacoeconomics (1+1)**

Pharmacoeconomics: The basic concepts of health economics, learning basic terms of health economics and understand key principles. Topics cover the economic mechanisms of health care markets as market failures, and government intervention. The course covers the key components of health care financing, and some methods of how to contain health care expenditure. Alongside the major definitions in health technology assessment, students should have an overview about different types of economic evaluation, budget impact analysis and their uses. Moreover, students should get familiar with different methods of pricing among which value-based pricing. Marketing: The objective of this course is to introduce students to the concepts, analyses, and activities that comprise marketing management, and to provide practice in assessing and solving marketing

problems. The course is also a foundation for advanced electives in Marketing as well as other business/social disciplines. Topics include marketing strategy, customer behavior, segmentation, market research, product management, pricing, promotion, sales force management and competitive analysis.

### **NP 906 Entrepreneurship (1+0)**

This course outlines the process of designing, launching and running a new business, which is often initially a small business. The people who create these businesses are called entrepreneurs. Entrepreneurship has been described as the "capacity and willingness to develop, organize and manage a business venture along with any of its risks in order to make a profit. While definitions of entrepreneurship typically focus on the launching and running of businesses, due to the high risks involved in launching a start-up, a significant proportion of start-up businesses have to close due to "lack of funding, bad business decisions, an economic crisis, lack of market demand, or a combination of all of these.

### **PC E09 Drug Design (1+1)**

The prime objective of this course is to prepare the students for professional practice by understanding the essentials of Medicinal Chemistry, and how the drugs, biological and toxicological activities are strongly correlated to their chemical structures (Structure-activity relationship; SAR), physicochemical properties and metabolic pathways. Focusing on patient-directed clinical care, the molecular aspects governing drugs' pharmacokinetics (ADME), pharmacodynamics, optimization of drug action, possible side effects, in addition to understanding drug interactions are targeted. In terms of chemistry, SAR, mechanism of action and side effects. The course is also designed to familiarize the students with drug design and molecular modelling covering structure-based and ligand-based drug design. This also includes the process of drug discovery and development from target identification until approval of a new drug. Much concern is given to lead structure identification, optimization and targeting certain receptors and enzymes active sites. Additionally, the course addresses the study of molecular docking, pharmacophore generation, and molecular modifications including prodrug design, stereochemistry alterations, isosteric replacement, drug metabolism and Quantitative Structure-activity relationship (QSAR).

### **PC E10 Advanced Pharmaceutical Analysis-Spectroscopy (1+1)**

Applications of instrumental methods of analysis (ultraviolet and infrared spectroscopy; NMR; mass spectrometry; atomic absorption spectroscopy) to pharmaceutical compounds.

### **PT E09 Applied Industrial Pharmacy (1+1)**

Good manufacturing practice regulations and quality assurance with emphasis on process validation and sampling techniques.

### **PT E10 Good Manufacturing Practice (1+1)**

This course involves the principles of the Current Good Manufacturing Practices (cGMP). It exposes students to all aspects of validation, calibration, inspection and the requirements for manufacturing facilities. It also provides students with a review of the process engineering, technology transfer, personnel management, training and hygiene, premises and contamination control, documentation and auditing, process deviation with emphasis on risk management, complaint handling and product recall theory.

### **PT E11 Cosmetic Preparations (1+1)**

Definition and concepts, classification, hair, bath, fragrance, and make-up preparations, nail lacquers, shaving and after-shave preparations, skin care, anal hygiene products, anti-perspirants and deodorants, quality control tests and evaluation of cosmetic products.

### **PT E12 Veterinary Pharmacy (1+1)**

Animal nutrition, Veterinary anatomy and physiology. General clinical veterinary medicine. General preventive veterinary medicine. Minor surgery. Poultry management and prevention of disease.

### **PT E13 Advanced Pharmaceutical Technology (1+1)**

This course is designed to provide students with various important aspects of quality assurance, cGMP, quality audit, and process validation; including regulatory and quality compliance as applied to pharmaceutical industries. The students will also be provided with in-depth knowledge in the organization and operation of the major departments of pharmaceutical companies, as well as ways of dealing with regulatory and compliance issues. Additionally, the course will provide advanced information on drug discovery & development process, including IND, NDA & ANDA, drug master file & therapeutic equivalent codes. Other essential topics such as production & operational management, production planning & control shall be covered. In addition, various in-process quality control tests needed to assess some sterile and non-sterile products shall also be discussed. The course will also include pilot plant and scale up techniques, design, construction and operation of clean rooms as well as recent advances in packaging techniques for various pharmaceutical dosage forms, including stability & regulatory aspects of packaging.

### **PT E14 Medical Devices (1+1)**

In this course you will learn how medical device industry innovates and brings transformational products to market. The take-away messages from this course are that there are many exciting ideas that never make it off the cutting room floor of universities and research labs. Furthermore, those devices that do make it have to quite novel to compete in an increasingly crowded space. The skills gained from this course to enable a successful capstone is an appreciation of how medical devices are innovated amidst a sea of regulation and intellectual property constraints. You will be better prepared to understand the features of likely successful medical device before it goes to market and competes to enhance and save lives.

### **PT E15 Drug Metabolism and Transport (1+1)**

In the course the student will be able to: recognize the identity, distribution, regulation and species-related differences of major drug-metabolizing enzymes and transporters. Evaluate the appropriate application of experimental models and protocols to drug metabolism and transport issues in vivo and in vitro during discovery. Interpret the relative importance of various metabolic pathways. Describe how information from the drug discovery phase is used in making preclinical decisions on preclinical drug candidates. Utilize data from in vitro and in vivo drug metabolism and transport experiments to predict drug disposition in humans; and Explain scientific and regulatory expectations with respect to drug metabolism and transport studies, and the impact of these studies in accelerating drug development.

### **PT E16 Protein Pharmaceuticals (1+1)**

This course is designed to acquaint students with the field of biotechnology. Topics will include introduction, definitions, history of biotechnology, & major areas of contribution of biotechnology. Chromosomes, biotechnological techniques of recombinant DNA technology, including cloning of DNA, PCR, Gene libraries (Genomics libraries, & c-DNA libraries), DNA sequencing, Sanger sequencing & Human Genome Project shall be discussed. Monoclonal antibodies, antisense oligonucleotides and gene therapies will be thoroughly covered. The course also entails methods adopted for preparation of biotechnology drug products and their evaluation, stability and storage. The current marketed biotechnology drug products including therapeutic proteins, as well as the future prospects of biotechnology drug products shall be covered.

### **PG E07 Complementary Therapies (1+1)**

In this course, the student will be acquainted with up to date medical practices, and the main differences between these practices with special emphasis on Complementary and Alternative Medicine (CAM). The course shall cover all systems of CAM that are based on different philosophies, including; alternative medical system, mind-body system, biological-based system, manipulative body-based system, energy system and blood cupping. In addition, for each of the above systems, the course shall cover different philosophies, diagnostic techniques, therapies, indications, and contraindications.

### **PG E08 Productions and Manufacture of Medicinal Plants (1+1)**

Commercial production of medicinal plants: cultivation, collection, drying, preservation, extraction, quality control, and final packaging of entire or powdered forms or extracts.

### **PG E09 Chromatography and Separation Techniques (1+1)**

Introduction and modes of separation, gel filtration and permeation, ion exchange chromatography, type properties, ion exchange and non-ion exchange manifestation and applications. High-pressure liquid chromatography, gas liquid chromatography and their applications.

### **PG E10 Aromatherapy and Herbal Cosmetics (1+1)**

Upon successful completion of this course, the students should be able to know guidelines for prescribing herbal medicinal drugs on the basis of the pharmacological properties of these drugs including therapeutic uses, mechanism of action, dosage, adverse reactions, contraindications & drug interactions. The course also allows students understand pharmacotherapeutic principles applied to the treatment of different diseases, pharmacovigilance and rational use of drugs. Also, the student should understand the basis of complementary and alternative medicine with emphasis on herbal remedies, nutritional supplements, homeopathies, aromatherapy & their effect on maintaining optimum health and prevention of chronic diseases. It includes studying of medicinal plants portfolios in relation to Phytopharmaceuticals in Egyptian Market.

### **PG E11 Biotechnology of Medicinal Plants (1+1)**

By the end of this course, the student will be able to: Emerging Trends in Medicinal Plant Biotechnology. Medicinal Compounds Produced in Plant Cell Factories. Biotechnological Characterization of Populations of *Podophyllum hexandrum* Royle. Traditional and Biotechnological Strategies for Conservation of *Podophyllum hexandrum* Royle. Microsatellite Markers: Potential and Opportunities in Medicinal Plants. In-vitro Propagation of Medicinal Plants for Conservation and Quality Assurance. Podophyllotoxin and Related Lignans: Biotechnological Production by In Vitro Plant Cell Cultures. Hairy Root Culture: Copying Nature in New Bioprocesses. Genetic Transformation of *Catharanthus roseus* (L.) G. Don. for Augmenting Secondary Metabolite Production. Analytical Platforms and Databases from Plant Transcriptomics to Metabolomics. Docking-based Virtual Screening of Anticancer Drugs. Population Structure and Molecular Characterization of *Podophyllum hexandrum*. Plant Virus Vector Systems for the Production and Delivery of Biopharmaceuticals. Novel Medicinal Plants for the Production and Delivery of Vaccines.

### **PM E07 Antimicrobial Stewardship (1+1)**

Introduction to the threat of antimicrobial resistance and how best to tackle it, burden of antimicrobial resistance and the importance of microbiology investigations in antibiotic therapy, antibiotic misuse and overuse as a driver of antimicrobial resistance and how to develop antibiotic guidelines. Evaluation of the strategies that have been implemented in hospitals and make more effective use of antimicrobials.

### **PM E08 Infection Control (1+1)**

Course includes the impact of community-acquired and healthcare-associated infections, infection prevention and control practices, the chain of infection, standard and transmission-based precautions, barriers and use of personal protective equipment (PPE), and strategies for preventing the spread of infectious disease to healthcare workers and patients.

**PM E09 Bioinformatics (1+1)**

Introduction to bioinformatics concepts and practice. Biological databases, sequence alignment, gene and protein structure prediction, molecular phylogenetics, genomics and proteomics. Students will gain practical experience with bioinformatics tools and develop. Basic skills in the collection and presentation of bioinformatics data, as well as the rudiments of programming in a scripting language.

**PO E06 Biological Standardization (1+1)**

Introduction to concepts of screening and bioassay in the course of drug discovery. Testing for drug activities belonging to the following drug classes: central and autonomic nervous systems, cardiovascular system, hormones, analgesics, and anti-inflammatory drugs.

**PO E07 Veterinary Pharmacology (1+1)**

Commonly used veterinary biological and pharmaceutical preparations, general sanitary and management procedures for the prevention and control of livestock diseases, brief review of infectious diseases and animal parasites.

**PP E16 Geriatric Pharmacotherapy (1+1)**

Geriatric Pharmacotherapy is an elective designed to prepare the student to provide pharmaceutical care to the elderly patient. The course is composed of 3 sections covering general principles of aging and geriatric assessment skills, followed by the pharmacotherapy of selected disease states and syndromes common to the senior population and ending with an overview of geriatric & consultant pharmacy practice.

**PP E17 Interprofessional Skills (1+1)**

By the end of IPEA 500, students will be able to: Understand and respect the roles, responsibilities and scope of practice of one's own profession and of other healthcare professions through a role play experience and open dialogue. Communicate role expectations of each healthcare profession within the context of interprofessional team functioning. Recognize the impact of teamwork on patient-centred practice. Appraise the attributes of effective interprofessional team functioning and their impact on effective healthcare delivery using a case-based approach.

**PP E18 Pharmacoeconomics (1+1)**

Clinical concepts of pharmacoeconomic efficiency, pharmacoeconomics methods, and drug therapy outcome measures are presented with an emphasis on the practical application of such principles.

**HM 001 Russian Language 1 (2+0)**

Russian alphabet: vowel and consonant sounds; the intonation of sentences; Personal pronouns; the gender of nouns; numerals (0-40); possessive pronouns; the plural of nouns; simple and compound sentences; Russian etiquette; Russian proverbs and sayings.

### **002 Russian Language 2 (2+0)**

The Adjective; ordinal numerals; names of the days; present tense of the verb; the adverb; the imperative; uses of the Prepositional to denote place and time; use of Accusative to denote the object of action and the day of the week; use of Genitive pronouns with a preposition "Y"; use of the Genitive with the words denoting a quantity; numerals (50-1000).

### **HM 003 English Language (2+0)**

Students learn basics of writing and how writing is evaluated. texts about pharmaceutical issues as "patient safety, effective communication with patients, safety culture.....etc.". Students translate parts of the texts above and others. Pharmaceutical idioms and abbreviations. Linguistics: Grammar, Phrasal verbs and Prepositions. How to express different life situations as" regret, request, apology, offer, suggestion, permission ...etc.