

Faculty of Pharmacy Ain Shams University
Curriculum of Bachelor Degree in Pharmaceutical Sciences (B.Pharm.Sci)

Table (1)
Study Plan
Prepharmacy Semester (1)

Course Title	Code #	Exam hours	Distribution of different grades on exams			Weekly hours		
			Total	Written	Practical	Practical	Lecture	Credit hours
Inorganic Chemistry	111/C	3	150	110	40	3	2	3
Physics	121/C	3	150	110	40	3	2	3
Zoology	131/C	3	150	110	40	3	2	3
Botany	141/C	3	150	110	40	3	2	3
English Language	151/C	2	50	50	-	-	2	2
Mathematics in Pharmacy	161/C	2	100	100	-	-	2	2
Medical Terminology and Pharmacy Orientation	171/3/1	2	100	100	-	-	2	2
Total			Grades = 850			12	14	18

Table (2)
Study Plan
Prepharmacy Semester (2)

Course Title	Code #	Exam hours	Distribution of different grades on exams			Weekly hours		
			Total	Written	Practical	Practical	Lecture	Total
Physical Chemistry	112/C	3	150	110	40	3	2	3
Biophysics	122/C	3	150	110	40	3	2	3
Organic Chemistry	132/C	3	150	110	40	3	2	3
Medical Botany	142/C	3	150	110	40	3	2	3
Anatomy and Histology	152/C	3	150	110	40	3	2	3
Biostatistics	162/C	2	100	70	30	3	2	3
Zoology	172/C	2	100	60	40	3	1	2
Total			Grades= 950			21	13	20

1. Pre-Pharmacy: (Total credit hours: 38)

Inorganic Chemistry (111/C)

Credit hours: 3

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Covers stoichiometry, atomic spectroscopy and modern electronic theory, the electron configurations and periodic classifications of atoms, chemical bonding and molecular structure, and nuclear chemistry.

Physics (121/C, 122/C)

Credit hours: 6

Lectures: 60 hrs; 2h/w for 30 weeks

Practical: 90 hrs; 3h/w for 30 weeks

Includes the study of description of motion, causes of motion, work, energy and machines, properties of liquids, properties of gases..

Zoology (131/C)

Credit hours: 3 hr

Lectures: 15 hrs; 1h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Deals with introductory information in cytology (manipulation of specimens, preparation of tissues, cell structure and chemical components of the cell), molecular biology and genetics, embryology, histology, general physiology, nutrition and nutrients, and metabolism.

Botany (141/C)

Credit hours: 3

Lectures: 30 hrs; 2 hrs/w, for 15 weeks.

Practical: 45 hrs; 3 hrs/w, for 15 weeks.

Deals with the plant taxonomy and plant physiology. Moreover, The course covers sources, origin and active constituents of the different parts of medicinal plants including their uses. The morphology and anatomy of these plants are also studied. In details, the two courses cover the following titles: morphology of seeds, roots, stems, leaves, flowers, and fruits, kingdoms Monera, Protista, fungi, plantae, plant physiology including diffusion, osmosis, permeability, photosynthesis, hormones, plant anatomy, principles of Pharmacognosy, origin of drugs, propagation from seeds, fermentation, factors affecting plant growth, selection and breeding of medicinal plants, preparation of drugs from plants, leaves, barks, galls, and woods.

English Language (151/C)

Credit hours: 2

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: None

Improves student's ability for writing and speaking English language.

Mathematics in Pharmacy (161/C)

Credit hours: 2

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: None

Provides the basics of mathematical methods of integration, derivatization, and regression. It also covers the mean value theorem and curve sketching, and systems of linear equations and matrices.

Medical Terminology and Pharmacy Orientation (171/3/1)

Credit hours: 2

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: None

Introduces students to the core of the pharmacy curriculum. The course also enables students to understand the principles of medical and pharmaceutical terminology and how to use these terms in the description of normal and pathological conditions of human physiology.

Physical Chemistry (112/C)

Credit hours: 3

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Covers many topics in physical chemistry including gas, liquid and solid states, chemical kinetics, chemical equilibrium, colligative properties of solutions, electrochemistry, colloids, phase equilibria, biophysical systems, transport of ions and molecules through the cell membrane, sound and light in medicine, and physics of diagnostic X-rays.

Medical Botany (142/C)

Credit hours: 3

Lectures: 30 hrs; 2 hrs/w, for 15 weeks.

Practical: 45hrs; 3 hrs/w, for 15 weeks.

Deals with the plant taxonomy and plant physiology. Moreover, The course covers sources, origin and active constituents of the different parts of medicinal plants including their uses. The morphology and anatomy of these plants are also studied. In details, the two courses cover the following titles: morphology of seeds, roots, stems, leaves, flowers, and fruits, kingdoms Monera, Protista, fungi, plantae, plant physiology including diffusion, osmosis, permeability, photosynthesis, hormones, plant anatomy, principles of Pharmacognosy, origin of drugs, propagation from seeds, fermentation, factors affecting plant growth, selection and breeding of medicinal plants, preparation of drugs from plants, leaves, barks, galls, and woods

Organic Chemistry (132/C)

Credit hours: 3

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Introduces students to the basics of organic chemistry including the development of organic chemistry as a science, chemical bonds, shapes of molecules, polar and non-polar molecules, orbital hybridization, isomerism, nomenclature of molecules with chiral centers, types of reactions, classification of organic molecules, nucleophilicity and basicity, alkanes, alkenes, alkynes, polyenes, halogen compounds, alcohols, thioalcohols, ethers, thioethers, aldehydes, ketones, carboxylic acids, derivatives of carboxylic acids at the alkyl group, polycarboxylic acids, unsaturated dicarboxylic acids, amines.

Anatomy and Histology (152/C)

Credit hours: 3

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Covers the general anatomy of the human body; with emphasis on muscular, cardiovascular, CNS, GIT, urinary, reproductive, and ENT systems. The course also illustrates and differentiates between different types of body cells and tissues.

Biostatistics (162/C)

Credit hours: 3

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Includes introduction to computers, operating systems, introduction to windows, introduction to BASIC language, normal distribution, sampling theory, estimation theory, tests of hypotheses, and analysis of variance.

Biophysics (122/C)

Credit hours: 3

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: 45hrs; 3h/w for 15 weeks

Includes the study of pressure and the circulatory system, molecular phenomena related to biological processes, internal energy, heat and temperature, the effects of heat, introduction to electricity and magnetism, practical electrical circuits, electrical safety in the hospital, electrical and electronic instruments, bioelectricity, elasticity and wave motion, the physics of hearing, the physics of vision, light and modern physics, and nuclear radiation.

Zoology (172/C)

Credit hours: 2 hr

Lectures: 15 hrs; 1h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Deals with taxonomy of animal kingdom, nutrition and nutrients, and metabolism.

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Table (3)
Study Plan
First Year Semester (1)

Course Title	Code #	Exam hours	Distribution of different grades on exams					Weekly hours		
			Total	Written	Oral	Practical	Midterm	Practical	Lecture	Credit hours
Pharmaceutical Organic Chemistry	211/6	3	300	150	60	60	30	3	2	3
Pharmaceutics	221/3	3	300	150	60	60	30	3	2	3
Analytical Pharmaceutical Chemistry	231/9	3	300	150	60	60	30	3	3	4
Pharmacognosy	241/8	3	300	150	60	60	30	3	2	3
Physiology	251/C	3	300	210	-	60	30	3	3	4
Psychology and Sociology	261/C	2	50	50	-	-	-	-	2	2
Total			Grades= 1550					15	14	19

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Table (4)
Study Plan
First Year Semester (2)

Course Title	Code #	Exam hours	Distribution of different grades on exams					Weekly hours		
			Total	Written	Oral	Practical	Midterm	Practical	Lecture	Credit hours
Analytical Pharmaceutical Chemistry	212/9	3	300	150	60	60	30	3	2	3
Physical Pharmacy	222/3	3	300	150	60	60	30	3	3	4
Pharmacognosy	232/8	3	300	150	60	60	30	3	2	3
General Microbiology and Immunology	242/7	3	300	150	60	60	30	3	2	3
Pharmaceutical Organic Chemistry	252/6	3	300	150	60	60	30	3	3	4
Human Rights*	262/C	1	50	50	-	-	-	-	1	1
Total			Grades= 1500					15	13	18

*This course is a university requirement not included in total grades.

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2. First Year Pharmacy: (Total credit hours: 36)

Pharmaceutical Organic Chemistry (211/6, 252/6)

Credit hours: 7

Lectures: 2 hrs; 2h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Covers over study of structures, synthesis, electrophilic, nucleophilic aromatic substitution reactions and reactions of organic classes such as arenes, nitro compounds, amines, phenols compounds with examples of pharmaceutical products, in addition to study of stereochemistry, and structures and reactions of carbohydrates, organic acids and aldehydes.

Pharmaceutics (221/3)

Credit hours: 3

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Introduces students to the basic knowledge of Pharmaceutics. It covers the basic principles of compatibility and incompatibility of drugs in prescriptions, solution and solubility,

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thermodynamics of solutions, pharmaceutical solvents, dissolution rates of solids in liquids, solution of gases in liquids, solution of solids in solids, pharmaceutical solutions, external liquids, ophthalmic, nasal , otic solutions, and galenical extracts.

Analytical Pharmaceutical Chemistry (231/9, 212/9)

Credit hours: 7

Lectures: 75 hrs; 3h/w for 15 weeks & 2h/w for 15 weeks

Practical: 90 hrs; 3h/w for 30 weeks

Refers to all methods used in qualitative and quantitative analysis as well as separation techniques; including acid-base titration, neutralization in aqueous and non-aqueous media, complexation titrations, precipitometric titrations, separation and identification of anions and cations, solvent extraction, spot tests, spectrophotometric, fluorimetric gravimetric analysis, and preparation of standard solutions.

Pharmacognosy (241/8)

Credit hours: 6

Lectures: 60 hrs; 2h/w for 30 weeks

Practical: 90 hrs; 3h/w for 30 weeks

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Deals with the morphological and histological structure of different organs of medicinal plants such as leaves, flowers, fruits, seeds, roots, rhizomes and barks. The role of these medicinal plants in the management of different disease conditions is also studied.

Physiology (251/C)

Credit hours: 4

Lectures: 45 hrs; 3h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Covers the normal physiology of different body systems with some emphasis on the physiological changes that accompany diseases. The course covers cardiovascular, respiratory, digestive, nervous (central and peripheral), urinary, endocrine and reproductive systems as well as blood elements.

Psychology and Sociology (261/C)

Credit hours: 2

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: None

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Covers different theories of Sociology and their application in the pharmaceutical profession. Also the course deals with the psychological basis for emotions, reflexes and psychological treatment. It also covers the assessment of the personality and psychological disturbances.

Physical Pharmacy (222/3)

Credit hours: 4

Lectures: 45 hrs; 3h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Covers the physical properties and guidelines for preparation of different pharmaceutical dosage forms such as emulsions, suspensions and colloids, with emphasis on different theories that control the stability, compatibility and expiry date of pharmaceutical preparations.

General Microbiology and Immunology (242/7)

Credit hours: 3

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

provides an overview on nature of microbial world, properties and classification of virus and fungi, Taxonomy and structure of bacteria, bacterial growth, bacterial physiology and metabolism, microbial genetics, in addition to principles of immunity and immune system.

Pharmaceutical Organic Chemistry (252/6)

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Credit hours: 7

Lectures: 3 hrs; 3h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Covers over study of structures, synthesis, reactions of organic classes such carbonyl compounds, carboxylic acids stereochemistry, and structures and reactions of carbohydrates,

Human Rights (262/C)

It's a university requirement course which deals with human rights nationally and internationally.

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Table (5)
Study Plan
Second Year Semester (1)

Course Title	Code #	Exam hours	Distribution of different grades on exams					Weekly hours		
			Total	Written	Oral	Practical	Midterm	Practical	Lecture	Credit hours
Pharmaceutical Organic Chemistry and Spectroscopy	311/6	3	300	150	60	60	30	3	3	4
Pharmaceutical Microbiology	321/7	3	300	150	60	60	30	3	2	3
Pharmaceutics	331/3	3	300	150	60	60	30	3	2	3
Biochemistry	341/5	3	300	150	60	60	30	3	2	3
Parasitology	351/C	3	200	140	-	40	20	3	2	3
Instrumental Analysis	361/9	3	300	150	60	60	30	3	2	3
Total			Grades=1700					18	13	19

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Table (6)
Study Plan
Second Year Semester (2)

Course Title	Code #	Exam hours	Distribution of different grades on exams					Weekly hours		
			Total	Written	Oral	Practical	Midterm	Practical	Lecture	Credit hours
Pharmaceutics	312/3	3	300	150	60	60	30	3	2	3
Medical Microbiology	322/7	3	300	150	60	60	30	3	2	3
Biochemistry	332/5	3	300	150	60	60	30	3	2	3
Chemistry of Natural Products	342/8	3	300	150	60	60	30	3	3	4
Pathology	352/C	3	200	140	-	40	20	2	2	3
Pharmacy Administration	362/2	1	50	50	-	-	-	-	1	1
Total			Grades=1450					14	12	17

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3. Second Year Pharmacy: (Total credit hours: 36)

Pharmaceutical Organic Chemistry & Spectroscopy (311/6)

Credit hours: 4

Lectures: 45 hrs; 3h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Covers the study of spectroscopy and elucidation of chemical structures by UV, IR, NMR, and mass spectroscopy, heterocyclic chemistry, polynuclear aromatic hydrocarbons, amino acids and peptides and lipids.

Pharmaceutical Microbiology (321/7)

Credit hours: 3

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Covers antimicrobial agents including antibiotics and non-antibiotics, sterilization (heat, radiation, gases, filtration, air, and their validation), and microbiological quality control of pharmaceuticals (hazards associated with contaminated products, raw materials, quality control

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of sterile products, microbial limit tests, quality control of biological products, and pyrogen tests).

Pharmaceutics (331/3)

Credit hours: 6

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Covers topical preparations (ointments, gels, pastes), toothpastes, transdermal drug delivery, pharmaceutical aerosols, suppositories, hair care products, lipsticks, parenterals and other dosage forms.

Biochemistry (341/5)

Credit hours: 3

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Includes the study of cell structure & biological membranes, chemistry of carbohydrates, lipids, amino acids, peptides & proteins, enzyme structure & function, chemistry of nucleotides & nucleic acid, porphyrins & bile pigments & biological oxidation.

Parasitology (351/C)

Credit hours: 3

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

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Covers the study of Helminthes including classes Cestoda & Nematoda, Protozoa including classes Mastigophora, Ciliophora, and Apicomplexa, and Arthropoda including Insecta & Arachnida.

Instrumental Analysis (361/9)

Credit hours: 3

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Helps students getting acquainted with the different methods of instrumental analysis and their application in the quantitative determination of pharmaceutical compounds. In detail, the course includes the study of spectrophotometry, spectrofluorometry, flame spectroscopy, atomic absorption, polarography, and different techniques of chromatography.

Pharmaceutics (312/3)

Credit hours: 3

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Covers topical preparations (ointments, gels, pastes), toothpastes, transdermal drug delivery, pharmaceutical aerosols, suppositories, hair care products, lipsticks, parenterals and other dosage forms.

Medical Microbiology (322/7)

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Credit hours: 3

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Covers in bacteriology: gram-positive cocci, gram-negative cocci, gram-positive bacilli, mycobacteria, gram-negative bacilli, Yersinia, Mycoplasma, Chlamydia, Rickettsiae, and Spirochetes, in virology: properties, cultivation, detection, growth, pathogenicity, infections, and classification of viruses. Individual classes of viruses are described, in mycology: diagnosis, chemotherapy, pathogenicity, and types of fungal infections.

Chemistry of Natural Products (342/8)

Credit hours: 4

Lectures: 45 hrs; 3h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Concerns with the study of carbohydrates, glycosides, tannins, in addition to introduction to chromatography that covers principles, theories and application in natural product analysis.

Pathology (352/C)

Credit hours: 3

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: 30 hrs; 2h/w for 15 weeks

Covers the basic pathological conditions such as inflammation and healing, bacterial infection (toxemia, septicemia, pyaemia), cell injury (swelling, necrosis, apoptosis), intra- and extracellular

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accumulation (fatty changes, hyaline changes, amyloidosis, pathological calcification, pathological pigmentation), granuloma, tuberculosis, syphilis, leprosy, Rhinoscleroma, Sarcoidosis, Actinomycosis, Moniliasis, parasitic diseases, circulatory disturbances (hyperemia, thrombosis, embolism, ischemia, infarction, gangrene, edema, hemorrhage, shock), disorders of cellular growth and tumors.

Biochemistry (332/5)

Credit hours: 6

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Includes the study chemistry, digestion, absorption & metabolism of carbohydrates, lipids & proteins. By the end of the course, student should be able to understand how human body manipulates & utilizes food components & what are the different strategies selected by the body to get enough energy under different environmental, health & dietary status.

Pharmacy Administration (362/2)

Credit hours: 1

Lectures: 15 hrs; 1h/w for 15 weeks

Practical: None

Covers fundamentals of administration, function of management, communication skills in pharmacy, principles of hospital pharmacy, community pharmacy practice, and location analysis.

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Table (7)
Study Plan
Third Year Semester (1)

Course Title	Code #	Exam hours	Distribution of different grades on exams					Weekly hours		
			Total	Written	Oral	Practical	Midterm	Practical	Lecture	Credit hours
Pharmaceutics	411/3	3	300	150	60	60	30	3	2	3
Pharmacology	421/1	3	300	150	60	60	30	3	2	3
Biopharmaceutics	431/3	3	300	150	60	60	30	3	2	3
Chemistry of Natural Products	441/8	3	300	150	60	60	30	3	3	4
Industrial Pharmacy	451/4	3	300	150	60	60	30	3	2	3
Pharmaceutical Chemistry	461/6	3	300	150	60	60	30	3	3	4
Pathophysiology	471/C	2	150	120	-	-	30	-	2	2
Total			Grades=1950					18	16	22

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Table (8)
Study Plan
Third Year Semester (2)

Course Title	Code #	Exam hours	Distribution of different grades on exams					Weekly hours		
			Total	Written	Oral	Practical	Midterm	Practical	Lecture	Credit hours
Drug Design	412/6	3	300	150	60	60	30	3	3	4
Pharmacology	422/1	3	300	180	60	-	60	-	2	2
Clinical Biochemistry	432/5	3	300	150	60	60	30	3	2	3
Toxicology	442/1	2	200	120	40	-	40	-	2	2
Clinical Pharmacy	452/2	3	300	150	60	60	30	3	2	3
Pharmacokinetics	462/2	3	300	150	60	60	30	3	2	3
Industrial Pharmacy	472/4	3	300	150	60	60	30	3	2	3
Total			Grades= 2000					15	15	20

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4. Third Year Pharmacy: (Total credit hours: 42)

Pharmaceutics (411/3)

Credit hours: 3

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Includes parenterals (types, solvents, release, preformulation & formulation, containers and closures, stability), ophthalmic products (drugs, penetration, formulation, containers, contact lens products), blood and related products (collection, blood clotting, anticoagulant, blood groups, concentrated human RBCs, dried human plasma, control of blood products, plasma substitutes), complexation and protein binding, radiopharmaceuticals, and non-prescription drugs (dental, ophthalmic, and drugs for treatment of acne, dandruff, seborrhea, psoriasis).

Pharmacology (421/1, 422/1)

Credit hours: 5

Lectures: 60 hrs; 2h/w for 30 weeks

Practical: 45 hrs; 3h/w for 15 weeks

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In the first semester, this course covers general principles of pharmacology (e.g. pharmacodynamics, pharmacokinetics, tolerance, adverse reactions), autonomic nervous system (adrenergic agonists and antagonists, cholinergic agonists and antagonists, neuromuscular blockers), cardiovascular system (antihypertensive drugs, antianginal drugs, antiarrhythmic drugs, drugs used in congestive heart failure), gastrointestinal drugs (treatment of ulcers, digestants, antiemetic, antidiarrheal, prokinetic agents), autacoids (histamine and antihistamines, bradykinin and its antagonists, endogenous kallikrein-kininogen-kinin system), eicosanoids and PAF), and drugs for treatment of bronchial asthma. In the second semester, CNS acting drugs (anxiolytics and hypnotics, opioid analgesics, antidepressants, neuroleptics), analgesics, antipyretic and anti-inflammatory drugs, hormones, and chemotherapy (cytotoxics, anthelmintics, antimalarials, antibacterial, antifungal, antiviral) are being taught.

Biopharmaceutics (431/3)

Credit hours: 3

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Covers fundamentals and background principles of biopharmaceutics, biological availability and drug metabolism through studying drug metabolism, absorption, distribution, elimination, and bioavailability. An assessment of biopharmaceutical properties is also elaborated.

Chemistry of Natural Products (441/8)

Credit hours: 4

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Lectures: 45 hrs; 2h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Concerns with study of alkaloids, volatile oils (separation, preparation, medical application), and techniques used for analysis and quantitative measurement of natural products such as HPLC, gas chromatography, IR, UV, mass spectroscopy, and NMR.

Industrial Pharmacy (451/4, 472/4)

Credit hours: 6

Lectures: 60 hrs; 2h/w for 30 weeks

Practical: 90 hrs; 3h/w for 30 weeks

Covers several aspects of formulation, industrial processing, fundamentals of unit operations (drying, extraction, distillation, evaporation, air conditioning and humidification, filtration), fluid flow, heat flow, mass transfer, and materials of fabrication for a pharmaceutical plants. The course also includes manufacturing the product on a small scale, quality control tests, packaging and all the other procedures involved in drug industry.

Pharmaceutical Chemistry (461/6)

Credit hours: 4

Lectures: 45 hrs; 3h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

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Covers antibiotics (β -lactams, tetracyclines, aminoglycosides, chloramphenicol, macrolides), sulfonamides and dihydrofolate reductase inhibitors, antineoplastic, antimalarial, antifungal, antiviral, antiinfective, antiprotozoal, antimycobacterial, antileprosy, antidiabetic drugs. In addition, diuretics, diagnostic agents and immunostimulants are also included.

Pathophysiology (471/C)

Credit hours: 2

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: None

Covers the basic physiological changes that accompany different diseases in the human body. This includes cardiovascular, respiratory, digestive, nervous, urinary, endocrine, reproductive, and blood systems. Also, it covers genetic disorders, malignancy, and epidemic diseases.

Drug Design (412/6)

Credit hours: 4

Lectures: 45 hrs; 3h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

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An advanced course that covers non-computational drug design (improvement of binding interaction between drug and its target, drug actions at receptors, steric features of drugs, improvement of pharmacokinetics properties of the drugs, quantitative structure activity relationship (2D & 3D), prodrugs), Drug metabolism (phases I & II), adrenergic agents, cardiovascular drugs, hypolipidemic agents, anticoagulants, CNS stimulants, CNS depressants, cholinergics and anticholinergics, antiparkinsonism drugs, local anesthetics, antiallergic drugs, antiulcer drugs, and eicosanoids.

Clinical Biochemistry(432/5)

Credit hours: 3

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Clinical study that includes hormones & their disturbances, liver & kidney function tests, biomarkers of cardiovascular diseases, disorders of carbohydrate, lipid & protein metabolism, prenatal diagnosis, tumor markers, acid-base balance, and molecular biology techniques (PCR, DNA sequencing, Southern blot, cloning, transgenic animal model, site-directed mutagenesis, and applications of recombinant DNA technology in medicine, forensics, environmental health, and pharmaceutical production).

Toxicology (442/1)

Credit hours: 2

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Lectures: 30 hrs; 2h/w for 15 weeks

Practical: None

Covers general principles of toxicology (acute, subacute and chronic toxicity, systemic versus local effects, domestic and occupational exposure, intentional and non-intentional poisoning, mechanisms of toxicity, factors modifying toxicity, chemical carcinogenesis, mutagenesis, teratogenesis, and markers of toxicity), toxic agents (metals, pesticides, animal poisons, plant poisons, food poisoning), environmental toxicology (air pollution, water pollution, biohazards of chemical and biological warfare).

Clinical Pharmacy (452/2)

Credit hours: 3

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

An integrated course that utilizes previous studies in pathophysiology, basic and clinical biochemistry, pharmacology in the design of effective and safe treatment for patients. The course is divided into theoretical lectures and practical discussions that convey to students scientific and practical experience in handling patients.

Pharmacokinetics (462/2)

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Credit hours: 3

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Covers mathematical fundamental, zero and first order kinetics, pharmacokinetics models, one-compartment open model – iv bolus (mathematical treatment, graphical representation, evaluation of pharmacokinetics parameters, excretion, metabolism, clearance, apparent volume of distribution, area under the curve), two-compartment open model – iv bolus, one-compartment open mode – iv infusion, one-compartment open model – extravascular administration, nonlinear pharmacokinetics, multiple drug dosing, clinical applications.

Pharmacology (422/1)

Credit hours: 5

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

In the first semester, this course covers general principles of pharmacology (e.g. pharmacodynamics, pharmacokinetics, tolerance, adverse reactions), autonomic nervous system (adrenergic agonists and antagonists, cholinergic agonists and antagonists, neuromuscular blockers), cardiovascular system (antihypertensive drugs, anti-anginal drugs, antiarrhythmic drugs, drugs used in congestive heart failure), **gastrointestinal drugs (treatment of**

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ulcers, digestants, antiemetic, antidiarrhial, prokinetic agents), autacoids (histamine and antihistamines, bradykinin and its antagonists, endogenous kallikrein-kininogen-kinin system), eicosanoids and PAF), and drugs for treatment of bronchial asthma. In the second semester, CNS acting drugs (anxiolytics and hypnotics, opioid analgesics, antidepressants, neuroleptics), analgesics, antipyretic and anti-inflammatory drugs, hormones, and chemotherapy (cytotoxics, anthelmintics, antimalarials, antibacterial, antifungal, ant viral) are being taught.

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Table (9)
Study Plan
Fourth Year Semester (1)

Course Title	Code #	Exam hours	Distribution of different grades on exams					Weekly hours		
			Total	Written	Oral	Practical	Midterm	Practical	Lecture	Credit hours
Clinical Pharmacy	511/2	3	300	150	60	60	30	2	2	3
Clinical Pharmacology	521/1	3	300	150	60	60	30	3	2	3
Pharmacy Practice	531/2/3	3	300	150	60	60	30	3	2	3
Quality Control of Herbal Products	541/8	3	300	150	60	60	30	3	2	3
Biotechnology	551/7	2	200	120	40	-	40	-	2	2
Pharmaceutical Chemistry	561/6	3	300	150	60	60	30	3	2	3
Pharmacy Law	571/C	1	50	50	-	-	-	-	1	1
First Aid	581/C	1	50	50	-	-	-	-	1	1
Total			Grades=1800					14	14	19

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Table (10)
Study Plan
Fourth Year **Semester (2)**

Course Title	Code #	Exam hours	Distribution of different grades on exams					Weekly hours		
			Total	Written	Oral	Practical	Midterm	Practical	Lecture	Credit hours
Dosage Form Design	512/3	3	300	150	60	60	30	3	2	3
Public Health	522/C	2	200	140	40	-	20	-	3	3
Analysis of Food and Cosmetics	532/9	3	300	150	60	60	30	3	2	3
Good Manufacturing Practice	542/4/9	2	200	120	40	-	40	-	2	2
Drug and Poison Information	552/1	1	100	80	-	-	20	-	1	1
Clinical Toxicology	562/1	3	300	150	60	60	30	3	2	3
Elective Course (1)	-	3	300	-	-	-	-	3	2	3
Elective Course (2)	-	3	300	-	-	-	-	3	2	3
Total			Grades= 2000					15	16	21

Distribution of weekly hours and grades for each elective course is applied according to what is mentioned in tables 11-A, 11-B, 11-C of the elective courses. The faculty council sets the regulations that organize teaching these courses.

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5. Fourth Year Pharmacy: (Total credit hours: 40)

Clinical Pharmacy (511/2)

Credit hours: 3

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: 30 hrs; 2h/w for 15 weeks

Covers hepatology (laboratory investigations, jaundice, acute viral hepatitis, chronic hepatitis, complications), obstetrics (disorders of pregnancy that include hypertension, congestive heart failure, chronic renal failure, diabetes mellitus, thyroid disorders), peptic ulcer, gastroesophageal reflux, and diabetes mellitus (classification, types, lab tests, lines of treatment, insulin)

Clinical Pharmacology (521/1)

Credit hours: 3

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Covers lines of treatment for hormone disturbances, anemia, osteoarthritis & osteoporosis, rheumatoid arthritis, epilepsy, parkinsonism, dementia, and hyperlipidemia. Also, the course includes diuretics, general anesthetics and immunopharmacology.

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Pharmacy Practice (531/3/2)

Credit hours: 3

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Covers parapharmaceuticals and health care accessories, medical gases, veterinary pharmaceutical dosage forms, some of the incompatibilities encountered in pharmacy practice, pediatric and geriatric aspects of pharmaceuticals, extemporaneous prescription compounding, dispensing of cytotoxic agents, therapeutic drug monitoring, home health care, patient compliance and patient counseling, drug information and pharmaceutical advice, and pharmaceutical care and disease state management.

Clinical Toxicology (541/1)

Credit hours: 3

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Includes management of poisoning (investigation, differential diagnosis, symptomatic treatment, treatment measures, specific antidotes), medicinal cabinets (salicylates, acetaminophen, cardiac glycosides, tricyclic antidepressants, theophylline, hypervitaminosis), teratogenesis (sensitivity to teratogens, testing for teratogenesis, in vitro tests, hazards for drug use in pregnancy, drugs in breast milk), and drug dependence (cannabis,

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cocaine, heroin, barbiturates, phencyclidine, amphetamine, designer drugs, sedatives, benzodiazepines, hallucinogens, nicotine).

Biotechnology (551/7)

Credit hours: 2

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: None

Covers fermentation industry, immobilization technique, biotechnological products (Biomass, enzymes, antibiotics, amino acids, organic acids, vitamins, insulin, monoclonal antibodies, viral vaccines, modification of gene expression), principle of gene therapy, biotransformation, bioinsecticides, biopolymers, biosurfactants, biodegradation, bioleaching of metals, biosensors, biofuels, and genetic engineering (bacterial operon, principles of isolation and purification of nucleic acids (assessment of purity, quantitation), DNA manipulation, selection and screening of recombinants, southern hybridization, site directed mutagenesis, cloning).

Pharmaceutical Chemistry (561/6)

Credit hours: 3

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Covers vitamins (water and fat soluble vitamins), hormones (thyroid, corticosteroids, sex hormones, peptide hormones), CNS depressants, aging and antiaging therapies.

Pharmacy Law (571/C)

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Credit hours: 1

Lectures: 15 hrs; 1h/w for 15 weeks

Practical: None

Covers pharmacy laws, regulations of pharmacy practice, and laws that prohibit drugs intake & handling, govern medical services, control chemical & pharmaceutical commercial handling. Fundamentals and applications of Human Rights: general and pharmaceutical aspects.

First-Aid (581/C)

Credit hours: 1

Lectures: 15 hrs; 1h/w for 15 weeks

Practical: None

The course covers the basic guidelines for handling emergency status such as trauma, myocardial infarction, burns, poisoning, bleeding and coma.

Dosage Form Design (512/3)

Credit hours: 3

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Covers the study of development and registration of new pharmaceutical formulations, vehicles, polymers, new pharmaceutical forms, and in vitro assessment of dosage forms.

Public Health (522/C)

Credit hours: 3

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Lectures: 45 hrs; 3h/w for 15 weeks

Practical: None

Covers definition of public health and preventive medicine, epidemiology, epidemic curve, herd immunity, disease surveillance, disease eradication, morbidity rates, natality rates, mortality rates, methods of epidemiologic studies, communicable diseases, control of communicable diseases, immunobiologic agents (vaccines, toxoid, immunoglobulin, antitoxin), nosocomial infections, non communicable diseases, mental health, mental retardation, occupational medicine, environmental health, nutrition, food microbiology, microbiology of milk, microbiology of water, wastes disposal, and family health.

Analysis of Food & Cosmetics (532/9)

Credit hours: 3

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Covers the study of properties, composition, analysis of milk, tests for adulteration, oils & fats, analysis of oils and fats, analysis of cosmetics.

Good Manufacturing Practice (542/4/9)

Credit hours: 2

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: None

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Aims for introducing students to general guidelines and principles of good manufacturing practice & rules for monitoring and verification of product quality.

Drug and Poison Information (552/1)

Credit hours: 1

Lectures: 15 hrs; 1h/w for 15 weeks

Practical: None

Refers to drug & poison database and how to find, retrieve, analyze, and transfer this information. In detail the course covers systematic approaches to answering questions, formulating effective responses, drug information resources, literature evaluation, professional writing, legal responsibility for the provision of drug information, ethical aspects, medication misadventures and errors.

Quality Control of Herbal Products (562/8)

Credit hours: 3

Lectures: 30 hrs; 2h/w for 15 weeks

Practical: 45 hrs; 3h/w for 15 weeks

Deals with the principles of quality control: definitions, documentation, environmental monitoring, packaging systems, the finished product, the quarantine, and quality control laboratory. Emphasis on quality control of herbal products is achieved by focusing on major steps in quality control scheme, quantitative chromatographic analysis of herbal products,

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storage, preservation, marker determination, validation and applications to the quality control of renal herbals.

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Table (11-A)
Study Plan (Elective Courses)
Fourth Year Semester (2)

Course Title	Code #	Exam hours	Distribution of different grades on exams					Weekly hours		
			Total	Written	Oral	Practical	Midterm	Practical	Lecture	Credit hours
Chemistry and Analysis of Food	601/9	3	300	150	60	60	30	2	2	3
Chemotherapy	602/1/6	3	300	180	60	-	60	-	3	3
Planning , Marketing & Economics of Drugs	603/4	3	300	180	60	-	60	-	3	3
Clinical Pharmacy	604/2	3	300	180	60	-	60	-	3	3
Cosmetics	605/3	3	300	150	60	60	30	3	2	3
Hospital Pharmacy	606/2/3	3	300	150	60	60	30	3	2	3
Drug Interactions	607/1	3	300	180	60	-	60	-	3	3

* The specified departments set the curriculum for each course and specify its references in collaboration with one or more other departments according to the faculty council settings. The faculty council sets the regulations that organize teaching these courses.

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Table (11-B)
Study Plan (Elective Courses -
continued)
Fourth Year Semester (2)

Course Title	Code #	Exam hours	Distribution of different grades on exams					Weekly hours		
			Total	Written	Oral	Practical	Midterm	Practical	Lecture	Credit hours
Clinical Pharmacy Practice	608/2	3	300	150	60	60	30	3	2	3
Dosage Form Design	609/3	3	300	150	60	60	30	3	2	3
Clinical Pharmacokinetics	610/2	3	300	180	60	-	60	-	3	3
Drug Stability	611/3	3	300	150	60	60	30	2	2	3
Drugs of Abuse and Addiction	612/1	3	300	180	60	-	60	-	3	3
Nonprescription Drugs (O.T.C)	613/3	3	300	180	60	-	60	-	3	3
Communications in Pharmacy	614/2	3	300	180	60	-	60	3	2	3

* The specified departments set the curriculum for each course and specify its references in collaboration with one or more other departments according to the faculty council settings. The faculty council sets the regulations that organize teaching these courses.

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Table (11-C)
Study Plan (Elective Courses - continued)
Fourth Year Semester (2)

Course Title	Code #	Exam hours	Distribution of different grades on exams					Weekly hours		
			Total	Written	Oral	Practical	Midterm	Practical	Lecture	Credit hours
Drugs Spectrophotometric Quality Control	615/9	3	300	150	60	60	30	3	2	3
Microbiological Quality Control	616/7	3	300	150	60	60	30	3	2	3
Clinical Nutrition	617/2	3	300	180	60	-	60	-	3	3
Production of Medicinal and Aromatic Plants	618/8	3	300	180	60	-	60	-	3	3
Tissue Culture	619/7	3	300	150	60	60	30	3	2	3
Industrial Microbiology	620/7	3	300	150	60	60	30	3	2	3

*The specified departments set the curriculum for each course and specify its references in collaboration with one or more other departments according to the faculty council settings. The faculty council sets the regulations that organize teaching these courses.

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Elective courses

Elective courses are offered during the fourth academic year of study [Final year]. The student is allowed to choose any elective course only once per semester, these electives are:

	Credit Hours
• Chemistry and Analysis of Food (601/9)	3 (2+3)
• Chemotherapy (602/1/6)	3 (3+0)
• Planning, Marketing & Economics of Drugs (603/4)	3 (3+0)
• Clinical Pharmacy (604/2)	3 (3+0)
• Cosmetics (605/3)	3 (2+3)
• Hospital Pharmacy (606/2/3)	3 (2+3)
• Drug Interactions (607/1)	3 (3+0)
• Clinical Pharmacy Practice (608/2)	3 (2+3)
• Dosage Form Design (609/3)	3 (2+3)
• Clinical Pharmacokinetics (613/3)	3 (3+0)
• Drug Stability (611/3)	3 (2+3)
• Drugs of Abuse & Addiction (612/1)	3 (3+0)
• Nonprescription Drugs (613/3)	3 (3+0)

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- Communications in Pharmacy (614/2) 3 (2+3)
- Drug Spectrophotometric Quality Control (615/9) 3 (2+3)
- Microbiological Quality Control (616/7) 3 (2+3)
- Clinical Nutrition (617/2) 3 (3+0)
- Production of Medicinal & Aromatic Plants (618/8) 3 (3+0)
- Tissue Culture (619/7) 3 (2+3)
- Industrial Microbiology (620/7) 3 (2+3)