

Syrian Arab Republic

AL-Baath University

Faculty of Pharmacy



Study Plan

Department	Courses
Pharmaceutics and Pharmaceutical Technology	Pharmaceutics (1,2), Pharmaceutical Technology, Industrial Pharmacy (1,2), Community Pharmacy, Advertising and Marketing in Pharmacy, Physical Pharmacy, Biopharmacy and Pharmacokinetics, Clinical Pharmacy and Hospital Pharmacy
Pharmacology and Toxicology	Pharmacology (1,2,3), Toxicology, Forensic Toxicology, Clinical Pharmacology, Epidemiology and Public Health, Communication Skills for Pharmacists
Analytical and Food Chemistry	Pharmaceutical Physical Chemistry, Pharmaceutical Analytical Chemistry (1,2), Instrumental Analysis, Food Chemistry and Control, Nutrition and Dietary
Biochemistry and Microbiology	Biochemistry (1,2), Microbiology (1,2), Immunology, Hematology, Molecular Biology, Pharmaceutical Biotechnology, Scientific Writing, Clinical Biochemistry, Pharmaceutical Microbiology
Pharmaceutical Chemistry and Quality Control	Organic Chemistry (1,2), Pharmaceutical Chemistry (1,2), Drug Quality Control, Drug Synthesis, Medicinal Chemistry
Pharmacognosy	Pharmacognosy (1,2), Pharmacognostical Chemistry, Applied Pharmacognosy, Pharmacy Ethics and Legislations

First year courses

First Term			
Course name	Weekly hours		
	Theoretical	Practical	Total
Physics	3	2	5
Chemistry	4	2	6
Cell Biology	3	2	5
English 1	2	0	2
Medical Science History	2	0	2
Total	14	6	20

Second Term			
Course name	Weekly hours		
	Theoretical	Practical	Total
Physiology	3	2	5
Biostatistics	2	2	4
Genetics	2	0	2
Anatomy	3	2	5
English 2	2	0	2
Total	12	6	18

Second year courses

First Term			
Course name	Weekly hours		
	Theoretical	Practical	Total
Pharmaceutics 1	2	2	4
Organic Chemistry 1	2	2	4
Pharmaceutical Physical Chemistry	2	2	4
Arabic	2	0	2
Computer Skills	2	2	4
English 3	2	0	2
National Culture	2	0	2
Total	14	8	22

Second Term			
Course name	Weekly hours		
	Theoretical	Practical	Total
Biochemistry 1	2	2	4
Organic Chemistry 2	2	2	4
Pharmaceutical Analytical Chemistry 1	2	2	4
Pharmaceutics 2	2	2	4
Pharmacognosy 1	2	2	4
English 4	2	0	2
Total	12	10	22

Pharmaceutics (1) Course

Second Year, First Semester, 2 hours Class and 2 hours Lab weekly

Class Section Topics

- 1- Introduction to Pharmaceutics Sciences
- 2- Drug Classification
- 3- Drug Doses
- 4- Pharmacopeias
- 5- Drug Administration Routes and Drug fate in the body
- 6- Pharmaceutical Excipients

- 7- Pharmaceutical Operations
- 8- Pharmaceutical Dosage Forms
- 9- Drug Labelling and Packaging
- 10- Drug Storage

Lab Section Topics

- 1- How to Use Pharmacopeias
- 2- Discussion of some Formulations
- 3- Powders Preparation
- 4- Solutions Preparation
- 5- Lotions Preparation
- 6- Collutoriums Preparation
- 7- Mucillages Preparation
- 8- Glycerites Preparation

Organic Chemistry (1) Course

Second year, first semester, 2 hours class and 2 hours lab weekly

Class section topics

1. introduction
2. chemical reactions
3. acids and bases
4. stereochemistry
5. functional groups
6. nucleophilic substitution reactions
7. elimination reactions
8. addition reactions
9. alkanes
10. alkenes
11. alkynes

Lab section topics

- general guidance
- basic operation in chemical synthesis: (extraction, recrystalization,..)
- determination of melting point
- determination of boiling point
- crystallization and recrystallization
- distillation
- extraction
- qualitative analysis of different elements in organic molecule

Pharmaceutical Physical Chemistry

Second Year , The first semester, 2 hours class and 2 hours lab weekly

Class Section Topics

- 1 - Matter, measurement and chemical calculations.

- 2 - Atomic and molecular structure.
- 3 - Chemical bonds (Molecular and intermolecular bonds) and structure of molecules.
- 4 - States of matter (Gaseous state, Liquid state and solid state).
- 5 - Thermodynamic and thermal chemistry.
- 6 - Chemical Kinetics and Stability of Drugs.
- 7 - Chemical Equilibrium.
- 8 – Electrochemistry.
- 9 - Physical and spectral properties.
- 10 - Surface chemistry.
- 11 - Collective properties of solutions.
- 12 - Colloidal solutions - Emulsions – suspensions.
- 13 – Nuclear chemistry and radioisotopes.

Lab Section Topics

- 1 - Determination of melting, freezing and boiling points.
- 2 - Determination of density of liquids and solid bodies.
- 3 - Polarization, measuring of refractive index
- 4 - Determination of constant dissociation of a weak acid.
- 5 - Study of adsorption of acetic acid to active carbon.
- 6 - Study of concentration and temperature effect on reaction rate
- 7 – Determination of the enthalpy of neutralization reaction using calorimeter.
- 8 – Measurement of viscosity and surface tension of liquids
- 9 - Distribution coefficient.
- 10 - Colloidal materials having effective surface.
- 11 - Preparation of emulsions and study of their properties.
- 12 - Determination of the marginal concentration of micelles formation
- 13 – Determination of the molecular weight of an organic matter using physical methods.
- 14 - Study of kinetics of first order reactions.
- 15 - Study of the kinetic reaction of aspirin hydrolysis in alkaline media.
- 16 - Determination of dissociation constant of a weak electrolyte by measuring electrical conductivity.

Biochemistry (1) Course

Second Year, Second Semester, 2 hours Class and 2 hours Lab weekly

Class section topics

1. Water and Minerals.
2. Proteins (structure and function)
 - Amino acids.
 - Peptides and peptide bond.
 - Protein denaturation.
 - Structural & functional proteins.
3. Enzymes.
4. Bio-energy & Biological oxidation.
5. Carbohydrates and metabolism:
 - Physiologically important carbohydrates.
 - Citric acid cycle.
 - Glycolysis.
 - Gluconeogenesis.
 - Glycogen synthesis and glycogenolysis.
 - The Pentose phosphate pathway.
6. Lipids and metabolism:
 - Physiologic importance.
 - Lipid types in the body.
 - Fatty acid oxidation.
 - Glycerides metabolism.
 - Cholesterol synthesis and metabolism.
7. Metabolism of proteins and amino acids:
 - Amino acid nitrogen catabolism (urea cycle)
 - Amino acid carbon body catabolism.
 - Amino acid conversion to specific products.

Lab section topics

1. Introduction to the work in biochemistry lab.
2. General laboratory methods:
 - Dialysis, centrifugation and ultra-centrifugation methods.
 - Electrophoresis methods.
 - Chromatography methods.
 - Immunochemical methods.
 - Radioactive methods.
3. Carbohydrate analysis:
 - Carbohydrates reductive reactions.
 - General detection of carbohydrates.
4. Analysis of proteins and amino acids:
 - Proteins separation and purification.
 - Protein dissipation and determination of its properties.
5. Lipid analysis:
 - Lipid isolation and extraction.
 - Lipid identification and calibration methods.
6. Vitamin analysis:
 - Detection of vitamins A, D, E, K.
7. Nucleic acid analysis:
 - DNA isolation and determination of its properties.
 - RNA isolation and determination of its properties.

Organic Chemistry (2) Course

Second year, second semester, 2 hours class and 2 hours lab

Class section topics

1. introduction
2. epoxides
3. alkyl halides
4. aldehydes
5. ketones
6. carboxylic acids
7. benzene derivatives
8. amines
9. organic metals
10. heterocycles
11. aromatic electrophilic substitution reactions
12. radical reactions

Lab section topics

- general guidance
- basic operation in chemical synthesis: (extraction, recrystallization,..)
- studies of some functional groups
- synthesis of some compounds
- determination of some functional groups
- separation of mixtures
- stereochemistry

Pharmaceutical Analytical Chemistry (1) Course

Second year, second semester, 2 hours class and 2 hours lab

Class section topics

1- solutions:

- concepts of solute, solvent and mechanism of dissolution
- solution concentration and its expression methods

2- basic principles of chemical equilibrium : reaction rate, equilibrium types, equilibrium constant, Le Chatelier's principle, activity and factor affecting activity

3- poorly soluble compounds and solubility product constant K_{sp} : calculation of solubility and solubility product constant, activity product, factors affecting solubility of precipitate, common ion effect, different ion effect, separated precipitations

4- principles and calculations of volumetric analysis

5- acid-base assay: pH concepts and calculation, buffer solutions, indicators, assay curves, applications.

6- non aqueous assay: principles , solvents, applications

7- precipitation assay: methods and applications

8- complexometric assay: Chelatometry and co-binding compound, complexone meter, mercury meter, assay curve, indicator

9- reduction-oxidation reaction: concepts of oxidation-reduction reactions, potention measurements, permanganometry, cerimetry, dichromatometry, Iodometry, bromatometry, examples

10- principles and calculations of gravimetry

11- process of gravimetry

12- gravimetry methods

13- organic precipitations and their application

Lab section topics

1- Experiments of acid base assay:

- An application of different indicators and their changes according to pH.
- Titration of strong acid using strong bases
- Titration of weak acids
- Titration of strong and weak bases with acids
- Titration of salt solution
- Preparation of specific concentration of acid and base solution
- preparation of buffer solution

2- Silver meter experiments

- titration of sodium chloride by Mohr's method
- titration of sodium chloride by Volhard Charpenier's method
- titration of potassium Iodine by Fajan's method
- titration of potassium cyanide by Liping-Deng's method
- barbituric acid derivatives
- mixture of two halogens indirectly

3- Redox reaction experiments

- potassium permanganate meter
- experiments of oxidation by chlorine and hypochlorite
- Iodine meter
- Iodate meter
- Bromate meter
- Potassium dichromate meter
- Ammonium ceric sulfate meter

4- Complexometric titration

- Indicators and blocking agent
- Titration of mixture of calcium and magnesium

5- Weight analysis experiments:

- Determination of crystal hydrate in crystallized barium chloride
- Titration of barium in salts
- Titration of iron as ferric oxide

Pharmaceutics (2) Course

Second Year, Second Semester, 2 hours Class and 2 hours Lab

Class Section Topics

1- Rheology

2- Solutions, Gargles, Mouth Washes

3- Syrups and Elixirs

4- Dispersion Systems:

4-1- Emulsions

4-2- Suspensions

4-3- Liposomes

4-4- Aerosoles

5- Sterile liquid Forms:

5-1- Eye drops

5-2- Parenteral Forms

Lab Section Topics

1- Solutions Preparation

2- Gargles Preparation

3- Mouth Washes Preparation

4- Syrups Preparation

5- Elixirs Preparation

6- Emulsions Preparation

7- Suspensions Preparation

8- Eye drops Preparation

9- Parenteral Forms Preparation

Pharmacognosy (1) Course

Second Year, Second Semester, 2 hours Class and 2 hours Lab weekly

Class section topics

- 1- General Introduction to pharmacognosy and medicinal plants.
 - 1- General definition.
 - 2- Sources of botanical-medicinal materials plant.
 - 3- Medicinal plant of plant origin.
 - 4- Medicinal plant harvesting.
 - 5- Determination of medicinal plant specifications.
- 2- Preserving medicinal plants and fixing them for the pharmaceutical industry.
 - 1- Fixing medicinal plant.
 - 2- Drying medicinal plant.
- 3- General outline for the study of medical drugs.
 - 1- Classification of medicinal plants.
- 4- Chemical components in medicinal plants.
- 5- Bacteria and dissociative plants.
 - 1- Bactericidal bacteria.
 - 2- Dextra-producing microbes.
 - 3- Bacteria used in the production of enzymes.
 - 4- Bacteria that produce antibiotics contain: tetracycline – bacitracin – polymyxin.

- 5- Fungi that produce antibiotics streptomycin- novobiocin – tetracyclin – aureomycin – cyclosporin – viomycin – chloramphenicol – rifampin.
- 6- Fungi that produce antibiotics to kill pathogenic fungi.
- 7- Fungi that produce antibiotics parasitic infections.
- 6- Thallophytes.
 - 1- Medical fungi.
 - 2- Toxic fungi.
 - 3- The fungi used in the production of yeast and in the method of semi synthetic medicine.
 - 4- Shibiyat.
- 7- Volatile oils and resins.
- 8- Carbohydrates their-derivatives.

Lab section topics

- 1- General introduction.
 - 1- Morphological and histological structures of plants and their evolution.
- 2- Pharmacognostical examination methods.
- 3- Microscopic tests of cross-section powder.
 - 1- Characteristics of leaves-cross section and powder(leaves of senna – aloe – tea – menta – thymus vulgaris – auculeptus-digitalis louata)
 - 2- Characteristics of flowers – cross – section and powder chamomel.
 - 3- Characteristics of stems cross- section and powder.
- 4- Detection of cheating drugs and types of fraud.

Third year courses

First Term			
Course name	Weekly hours		
	Theoretical	Practical	Total
Pharmacognosy 2	2	2	4
Pharmaceutical Analytical Chemistry 2	2	2	4
Pharmaceutical Technology	2	2	4
Pharmacology 1	2	2	4
Biochemistry 2	2	0	2
Microbiology 1	2	2	4
Immunology	2	0	2
Total	14	10	24

Second Term			
Course name	Weekly hours		
	Theoretical	Practical	Total
Pharmaceutical Chemistry 1	2	2	4
Instrumental Analysis	2	2	4
Pharmacognostical Chemistry	2	2	4
Advertising and Marketing in Pharmacy	2	0	2
Pharmacology 2	2	2	4
Microbiology 2	2	2	4
Hematology	2	2	4
Total	14	12	26

Pharmacognosy (2) Course

Third year, Second Semester, 2 hours Class and 2 hours Lab

Class section topics

Natural active chemical group

- 1- Al Kolloid, classification, the most important containing them.
- 2- Glycosides, classification-the most important containing them.
 - Cardiac glycosides.
 - Intraicin glycosides.
 - Cyanogenic glycosides.
 - Istitocyanic glycosides.
 - Alcoholic glycosides.
- 3- Sabonins, the most important drugs containing them.
- 4- Phenols, the most important drugs containing them.

Lab section topics

- 1- General introduction.
 - 1- Plant evaluation.
 - 2- Morphological and histological structures of plants and their evolution.
- 2- Pharmacognostical examination methods.
- 3- Microscopic tests of cross-section and powders.
- 4- Characteristics of stems cross-section and powder.
- 5- Characteristics of roots cross-section and powder.
- 6- Characteristics of rhizomes and tubers cross-section and powder.
- 7- Characteristics of peels cross-section and powder.

Pharmaceutical Analytical Chemistry (2)

Third year, first semester, 2 hours class and 2 hours lab

Class section topics

1- methods of extraction:

- Extraction by solvents:
 - two immiscible solvents: simple extraction, frequent extraction, extraction based on formation of metal-organic complexes, and extraction based on Ion pairs formation
 - Two miscible solvents: osmosis and distribution
- Extraction using solid phase:
 - Adsorption : principle and distribution.
 - Extraction using Ion exchange.

2- Chromatography methods:

- Adsorption: column, high performance liquid chromatography (HPLC), thin layer chromatography (TLC).
- Liquid liquid distribution: column, paper and thin layer.
- Liquid Gas distribution and Solide Gas distribution: Gas Chromatography.

3- Electrophoresis:

- Frontier electrophoresis.
- Zone electrophoresis.
- Factors affecting separation.
- Capillary electrophoresis.

4- Gel filtration.

5- Ultracentrifugation separation.

Lab section topics

- Extraction application using two immiscible solvents and evaluation of the yield.
- Extraction application using two miscible solvents.
- Extraction application based on formation of organic-metal complexes.
- Extraction application based on formation of Ion pair.
- Application of gel filtration.
- Application of paper chromatography.
- Application of thin layer chromatography.
- Extraction by Ion exchange.
- Separation of organic compound or metal ion mixtures using ion exchange.
- Separation of organic mixture using column by adsorption controlled by polarity of the mobile phase.
- Separation of organic mixture on column using liquid-liquid distribution
- Preparation of columns and calculation of theoretical layer number.
- Preparation of thin layers and studying factors that influence compound separation.
- The effect of phase acidity on some analytical processes.

Pharmaceutical Technology Course

Third Year, First Semester, 2 hours Class and 2 hours Lab

Class Section Topics

1- Pills and Pellets

2- Lozenges and Molded Tablets

3- Granules

4- Capsules

5- Compressed Tablets

6- Types of Compressed Tablets

7- Quality Control of Compressed Tablets

8- Coating of Tablets

8-1- Sugar Coating

8-2- Thin Layer Film Coating

9- Modified Release Solid Dosage Forms

Lab Section Topics

1- Pills and Pellets Preparation

2- Lozenges and Molded Tablets Preparation

3- Granules Preparation

4- Capsules Preparation

5- Tablets Preparation

6- Effervescent Tablets Preparation

7- Chewable Tablets Preparation

8- Vaginal Tablets Preparation

Pharmacology (1) Course

Third year- first semester, 2 hours class, 2hours lab weekly

Class section topics

1. General pharmacology:
 - Entrance to pharmacology and some important definitions.
 - Pharmacokinetics.
 - Pharmacodynamics.
 - Side Effects of drugs.
 - Drugs interactions
2. Specific Pharmacology:
 - Autonomic nervous system Drugs.
 - Sympathetic Nervous System Drugs.
 - Parasympathetic Nervous System Drugs.
3. Anxiolytic and Hypnotic Drugs.
4. Antidepressants.
5. Antipsychotic Drugs.
6. Antiepileptic Drugs.
7. Anti- Parkinson Drugs
8. Anesthetics Drugs:
 - Local anesthetics.
 - General anesthetics.
9. Muscle relaxants:
 - Peripheral Muscle relaxants
 - Central Muscle relaxants
10. Analgesics:
 - Opioids Analgesics.
 - Non- Opioids Analgesics.
 - Migraine Therapy
 - Rheumatic diseases Therapy
 - Gout Therapy

Lab Section Topics

1. Introduction to Experimental Pharmacology (Types and aims)
2. Materials and Methods used in Experimental Pharmacology and physiological analyzes used for isolated organs.
3. Experimental study of pharmacokinetics using methylene blue on experimental animal.
4. Studying the effects of Adrenergic Agonists and Antagonists.
5. Studying the effects of Cholinergic Agonists and Antagonists.
6. Application of some topical and general anesthetics on experimental animals.
7. Application of some drugs on rabbit's eye and studying its effects on the size of pupil.
8. Studying the effect of acetylcholine and its blockers on muscles.

Biochemistry (2) Course

Third year- first semester, 2 hours Class and 2 hours Lab

Class section topics

1. Vitamins:
 - Water soluble vitamins.

- Fat soluble vitamins.
- 2. Hormones (synthesis and biological importance):
 - Pituitary hormones.
 - Thyroid hormones.
 - Calcium status hormones.
 - Pancreatic hormones.
 - Adrenal cortex hormones.
 - Adrenal medulla hormones.
 - Sexual hormones.
- 3. Digestion, absorption and nutrition:
 - Digestion and absorption of Carbohydrates, proteins and lipids).
 - Nutrition and energy balance.
 - Nutritional disorders.
- 4. Porphyrins and bile pigments.
- 5. Hemostasis and Thrombosis.
- 6. Cellular membranes (structure and function)
- 7. Nucleic acids:
 - DNA structure and function.
 - RNA structure and function.

Microbiology (1) Course

Third year – First semester, 2 hours Class and 2 hours Lab

Class section Topics

- 1- General introduction:
 - a. General definitions
 - b. Classification of parasites
 - c. Nomenclature of parasites
 - d. Transmission routes of parasites
 - e. Pathogenic effects of parasites
 - f. Body response to parasites
 - g. Immunity in parasitic diseases
 - h. Epidemiology
 - i. Diagnosis of parasitic diseases
 - j. Treatment and protection of parasitic diseases
- 2- Protozoa
- 3- Helminthes
- 4- Arthropods
- 5- Fungi

Lab section Topics

- 1- Examination of stool
 - a. Direct wet film and stained slides
 - b. Identify the microscopic natural elements found in the stool
 - c. Study of the intestinal parasites found in stool
- 2- Examination of blood specimens:
 - a. Staining techniques of of blood preparations
 - b. Identify the microscopic natural elements found in the blood smear
 - c. Study of blood parasites
- 3- Parasitic examination of other pathogenic specimens
- 4- Fungi:
 - a. Direct examination
 - b. Examination of KOH preparations

- c. Study of fungal cultures
- 5- Identify the Insect vectors of infectious and parasitic diseases to human

Immunology Course

Third year - first semester, 2 hours Class

1. Introduction to the immune system:
 - Cells of the immune system.
 - Tissues of the immune system.
2. Innate immunity:
 - Factors affecting innate immunity.
 - Anatomical barriers to infection.
 - Chemical mediators.
 - Phagocytosis.
 - Inflammatory responses
 - Natural killer cells.
3. Adaptive immunity:
 - Antigens.
 - Structure and function of major histocompatibility complex molecules.
 - Lymphocytes.
 - Antigen-presenting cells.
 - Types of adaptive immunity:
 - Humoral immunity.
 - Cell-mediated immunity.
4. Antibodies.
5. The complement system.
6. Cytokines.
7. Immunity to infection:
 - Viral infections.
 - Bacterial infections.
 - Parasitic infections.
 - Fungal infections.
8. Vaccines.
9. Hypersensitivities, and chronic inflammation.
10. Immunodeficiency disorders.
11. Tolerance, autoimmunity.
12. Cancer and the immune system.
13. Transplantation immunology.
14. Antibody production.
15. Immunological techniques.

Pharmaceutical Chemistry (1) Course

Third year, second semester, 2 hours class and 2 hours lab

Class section topics

- Introduction to organic and inorganic pharmaceutical chemistry
- Studying the compounds and derivatives that are pharmaceutically and medically important:
 - Alcohols, phenols and other aseptics
 - Carboxylic acids and their derivatives (local anesthetics,..)
 - Amino acid and proteins
 - Aromatic sulphonic acids and their derivatives (antibacterial sulphonamides)
- Studying of medicinal compounds belonging to:

- Non-steroidal anti inflammatory drugs
- Central analgesic (opioides and their derivatives)
- Drugs of gout and hyperuricemia
- Hypoglycemic sulfamide
- Antihistamines
- Drug of digestive system: emetics, anti emetics, antacid, digestive enzymes and their inhibitory, hepatic drugs, antiparasitic drugs
- Drug of respiratory system : antitussive, expectoranta , antibronchial spasm
- Cardiac drugs: antiarrhythmic drugs, cardiovascular drugs, anti hyperlipidemia
- Coagulants and anticoagulants drugs
- vitamins

Lab section topics

- Metallic section:
 - Method of qualitative and quantitative analysis for pharmaceutical important elements in primary and secondary groups of periodic table.
 - Method of qualitative and quantitative analysis for pharmaceutical important derivatives of elements in primary and secondary groups of periodic table.
- Organic section: General glimps on Method of qualitative and quantitative analysis for pharmaceutical organic compounds belonging to:
 - Hydrocarbons
 - Halogen derivatives
 - Monoalcohol and polyalcohols
 - Phenols
 - Aliphatic and aromatic amines : revision of some members and their derivatives
 - organic acids and their derivatives : general detection and assay
 - sulfuric organic compounds : antibacterial sulphonamides
 - urea and its derivatives
 - carbohydrates

Instrumental Analysis Course

Third year, second semester, 2 hours class and 2 hours lab

Class section topics

1- Optical methods:

- Absorption:
 - Molecular optical absorption: visible spectroscopy, ultraviolet spectroscopy and infrared spectroscopy.
 - Atomic absorption.
- Emission:
 - Molecular emission: fluorescence and fluorometry.
 - Atomic emission: flamephotometry.

2- Kinetic methods of analysis: intermediation, enzymatic intermediation, fixed enzymes, application.

3- Mass spectrometry and Gas chromatography:

4- the devices that depend on nuclear magnetic resonance (NMR) and their application.

5- the devices that depend on electrochemical analysis:

- Potentiometry
- Amperometry

- Polarography
- Direct and indirect coulometry
- conductometry

Lab section topics

- application on spectroscopy methods
- practical concept of complementary color
- the determination of the maximum absorption wavelength, absorption curve and the solution concentration
- extinction coefficient
- absorption in ultraviolet
- assay in visible
- assay in ultraviolet
- organic mixture assay
- application of fluorometry
- application of flame spectroscopy
- application of atomic spectroscopy
- the use of pH meter in acid-base assay
- application of conductometry
- application of infrared spectrophotometry
- spectral study of chemical kinetics in drug analysis
- application of electrophoresis
- application of HPLC
- application of GC
- application of electrochemistry
- application of potentiometry
- application of coulometry
- application of amperometry
- application of polarography

Pharmacognostical Chemistry Course

Third year – Second semester, 2 hours Class and 2 hours Lab

Class section topics

- 1- General principles for the extraction of plant drugs.
- 2- Methods of extraction of plant drugs.
 - 1- General methodology for extraction.
- 3- Chromatography methods used in extraction of plant drugs.
- 4- Extraction of Alkaloids.
- 5- Extraction of Glycosides.
- 6- Extraction of Volatile oils.
- 7- Extraction of Carbohydrates.

Lab section topics

Chemical assays

- 1- General extraction methods.
- 2- Methods of extraction alkaloids.
- 3- Detection of alkaloids and their identity.
- 4- Assay of alkaloids.
- 5- Detection of saponins and their identity.
- 6- Detection of cardio glycosides, identity, assay.

- 7- Detection of antranoides, identification, assay.
- 8- Detection of flavonoides, tannins, fenols, identification, assay.
- 9- Extration of valotil oils, fraud imvestigation and assay.
- 10- Detection of cumarines and assay.
- 11- Detection assay of components of fatly substances and wax material.

Advertising and Marketing in Pharmacy Course

Third Year, Second Semester, 2 hours Class

1- Marketing

1-1-Develoement of Marketing Definition

1-2- Marketing Concepts

1-3- Fields of Marketing

1-4- Importance and Benefits of Marketing

1-5- Marketing Tasks

1-6- The pharmacist's need for Marketing

1-7- Marketing of Services

- Types of Services

- Service Characteristics

2- Medical Advertising

2-1- Customer Focused Selling

2-2- Customers' Types

2-3- Communication Skills

2-4- Handling Customer's Objections

2-5- Gaining Customer's Commitment

Pharmacology (2) Course

Third year, second semester, 2 hours class, 2 hours lab

Class section topics

- 1- The cardio- vascular system drugs:
 - Anemia drugs
 - Anticoagulants
 - Medication used in the treatment of bleeding
 - Antihypertensives
 - Diuretics
 - Anti-arrhythmic drugs
 - Coronary artery disease drug
 - Hyperlipidemias
- 2- The respiratory system

- 3- Asthma drugs
- 4- Chronic Obstructive pulmonary disease drugs
- 5- Allergic rhinitis treatment
- 6- Anti- cough and expectorant
- 3- Digestive system drugs
 - Peptic ulcer drugs
 - Chronic inflammatory bowel disease
 - Functional in intestinal syndrome irritable intestines
 - Constipation treatment “laxatives”
 - Antiemetic's drugs.
- 4- Hormones

- Hypothalamus Hormones
- Pituitary Hormones
- Thyroid Hormones
- Thyroid Hormones and parathyroid affecting calcium balance
- Adrenal Hormones
- Sex Hormones and derived from drugs
- Male sex Hormones and their similarities
- Female sex Hormones
- Contraception Hormones
- Hormonal treatment after menopause
- Treatment of menstrual cycle disorders
- Drugs affecting the uterus
- Pancreatic Hormones and drugs used in treatment of diabetes

Lab section topics

- 1- Studying the effect of cardiac glycosides, potassium and calcium on frog's heart.
- 2- Testing the effect of some anticoagulants on bleeding time in one of the experimental animals
- 3- Studying the effect of analgesic on experimental animals
- 4- Studying the effect of some drugs on the intestinal motility isolated from the experimental animal
- 5- Studying the effect of insulin and some anti- diabetic drug
- 6- Studying the effect of antihypertensive on the heart and vessels
- 7- Studying the effect of some vascular dilators on the vascular muscles
- 8- Studying the effect of some substances on the function of bronchi

Microbiology (2) Course

Third year – Second semester, 2 hours Class and 2 hours Lab

Class Section Topics

- 1- General Bacteriology:
 - a. Introduction to bacteriology
 - b. Structure of bacterial cell
 - c. Bacterial physiology
 - d. Bacterial reproduction and growth

- e. Atypical shapes of bacteria
 - f. Bacteriophage
 - g. Bacterial Immunity
 - h. Bacterial disease and epidemics
 - i. Diagnosis of bacterial diseases
 - j. Treatment and protection of bacterial diseases
- 2- Human pathogenic bacteria
- a. Gram positive cocci
 - b. Gram negative cocci
 - c. Gram positive bacilli
 - d. Anaerobic spore and non spore forming bacteria
 - e. Gram negative bacilli (Enterobacteriaceae)
 - f. Other gram negative bacilli
 - g. Mycoplasma, Chlamydia, Rickettsia
 - h. Spirochetes
 - i. Acid – fast bacteria
 - j. Normal flora
- 3- Human pathogenic viruses
- a. Viruses: General properties, structure, and classification
 - b. Viral replication
 - c. Diagnosis of viral diseases
 - d. Treatment and protection of viral diseases
 - e. DNA viruses
 - f. RNA viruses
 - g. Prions: structure, features, disease and diagnosis
 - h. Viral hepatitis

Lab Section Topics

- 1- Working in the bacterial laboratory
- 2- Sterilization and Disinfection
- 3- Specimen collection for bacterial examination
- 4- Direct microscopic exam and staining techniques
- 5- Bacterial culture
- 6- Biochemical Tests
- 7- Serological Tests
- 8- Antibiotic Susceptibility Test

Hematology Course

Third year - second semester, 2 hours Class and 2 hours Lab

Class section topics

- 1. Introduction to hematology.
- 2. Hematopoiesis: blood cells formation.
- 3. Red blood cells:
 - Normal value of red cells.
 - Red cells functions.
 - Red cells metabolism.
 - Abnormal red cell morphology.
- 4. Hemoglobin:
 - Hemoglobin structure and synthesis.
 - Types of hemoglobin.
 - Hemoglobin function.
 - Abnormal hemoglobins.

5. White blood cells:
 - Normal value of white cells.
 - White cell metabolism.
 - Types of white cells and their functions.
 - Abnormal white cell morphology.
6. Platelets:
 - Normal value of platelets.
 - Platelets structure.
 - Platelets metabolism.
 - Platelets functions.
7. Bone marrow examination.
 - Sites of bone marrow aspiration.
 - Bone marrow aspiration indications.
8. Red cell disorders:
 - Anemias.
 - Polycythemia.
9. White cell disorders.
 - Nonmalignant disorders of leukocytes.
 - Malignant leukocyte disorders:
 - Acute leukemia
 - Chronic leukemia
 - Multiple myeloma
10. Lymphatic system diseases:
 - Malignant lymphomas
 - Hypersplenism.
11. Hemostasis (Coagulation):
 - Primary and secondary hemostasis.
 - Disorders of primary hemostasis
 - Disorders of secondary hemostasis
12. Blood group system.
13. Blood transfusion tests and transfusion therapy.
14. Complications of blood transfusion.
15. Hemolytic disease of the newborn.

Lab section topics

1. Collection and handling of blood.
2. Blood collection tools and anticoagulants.
3. Red blood cell count.
4. Hemoglobin determination.
5. Hematocrit determination.
6. Red cell indices.
7. Determination of erythrocyte sedimentation rate (ESR).
8. Reticulocyte count.
9. Abnormal red cell morphology.
10. Sickling test.
11. Platelet count.
12. White blood cell count.
13. Staining dyes and methods of staining.
14. Smear (film) preparation.
15. Differential leukocyte count.
16. Bleeding time and coagulation time determination.
17. Clot retraction.
18. Prothrombin time.

19. Partial thromboplastin time.
20. Blood group and Rh-factor determination.
21. Coombs tests.
22. C-reactive protein (CRP).

Fourth year courses

First Term			
Course name	Weekly hours		
	Theoretical	Practical	Total
Pharmaceutical Chemistry 2	2	2	4
Applied Pharmacognosy	2	0	2
Industrial Pharmacy 1	2	2	4
Pharmacology 3	2	0	2
Toxicology	2	2	4
Drug Synthesis	2	2	4
Immunology Pharmacy Ethics and Legislations	2	0	2
First Aid	2	0	2
Total	16	8	24

Second Term			
Course name	Weekly hours		
	Theoretical	Practical	Total
Food Chemistry and Control	2	2	4
Molecular Biology	2	2	4
Community Pharmacy	2	0	2
Forensic Toxicology	2	2	4
Industrial Pharmacy 2	2	2	4
Scientific Writing	2	0	2
Physical Pharmacy	2	0	2
Pathology	2	0	2
Total	18	10	28

Pharmaceutical Chemistry (2) Course

Forth year, first semester, 2 hours class and 2 hours lab

Class section topics

Studying of medicinal compounds belonging to:

- Natural and synthetic sympathetic stimulant
- Parasympatholytics : atropines and its derivatives
- Psychologic drugs : hypnotics, tranquilizers, anti epilepsy, antipsychotic , antidepressants
- Diuretic sulfamides
- Antimalaria drugs
- Tuberculosis drugs
- Antibiotics (peptide and saccharide structure, tetracyclines, macrolides, quinolones, Antifungal)
- steroidal Hormones
- anticancer drugs

Lab section topics

- identification and purity meters for organic medicinal compounds

- methods of organic medicinal compounds assay
- identification, purity determination and assay of following organic medicinal compounds:
 - phenolic acid : Aspirin
 - pyrazoles : antipyrines, pyrimidone and phenylbutazones
 - morphines and derivatives: morphin chlorhydrate, nalorphine chlorhydrate, codein phosphate
 - betaphenyl ethyl amine : adrenaline tartarate
 - atropines and its salts
 - urethanes
 - benzodiazepines derivatives
 - phenothiazines derivatives
 - diuretic sulfamides: acetazolamides
 - quinolones
 - isoniazide and paraminosalicylic acid
 - penicillines
 - chloramphenicol
 - streptomycines
 - tetracyclines
 - steroidal hormones

Applied Pharmacognosy Course

Fourth year – First semester, 2 hours Class

- 1- Origins of treatment by medical plants.
- 2- Homeopathic plant treatment.
- 3- Misuse of medicinal plant.
- 4- Pharmaceutical drug interactions.
- 5- Drug used in treatment and protection of digestive system diseases.
- 6- Drugs used in treatment and protection of urinary diseases.
- 7- Drug used in treatment and protection of cardiovascular diseases.
- 8- Drugs used in treatment and protection of dermal and rheumatoid disease.
- 9- Natural products assays.

Industrial Pharmacy (1) Course

Fourth Year, First Semester, 2 hours Class and 2 hours Lab

Class Section Topics

- 1- Structure of Skin and Drug Absorption through it
- 2- Characteristics and Classification of Excipients
- 3- The Most Important Raw Materials used in Dermal Preparations
- 4- Preparation and Packaging of Dermal Preparations
- 5- Quality Control of Dermal Preparations
- 6- Ointments and Pastes
- 7- Creams
- 8- Gels
- 9- Suppositories

10- Vaginal ovals

11- Other Pharmaceuticals Administered by Rectal Way

Lab Section Topics

1 - Creams Preparation

- Cream containing natural surfactant
- Cream containing natural surfactant formed during the preparation
- Cream containing artificial surfactant
- Cream o/w
- Cream w/o

2- Ointments Preparation

- Hydrophobic ointment
- Hydrophilic ointment
- Poly ethylene glycol ointment

3- Paste Preparation

4- Gels Preparation

5- Suppository Preparation

6- Preparation of Vaginal Ovals

Pharmacology (3) Course

Fourth year, first semester, 2hours class

- 1- Antibiotics
- 2- Antifungals
- 3- Antivirals
- 4- Antiprotozoal
- 5- Anti-helminthic
- 6- Anti cancer
- 7- Medication affecting the immune system
- 8- Skin drugs

Toxicology Course

Fourth year, first semester, 2 hours class and 2 hours lab

Class section topics

1. General principals in toxicology
 - 1.1 Substance toxicity concepts
 - 1.2 Toxicity tests (acute, subacute, subchronic, chronic)

- 1.3 Factors modifying toxic effects
- 1.4 Mechanism of toxic effect
- 2. Toxic agents
 - 2.1. Acute intoxication
 - 2.1.1 Toxic syndromes
 - 2.1.2 Toxicity in specific population (neonates, elderly, pregnant women and breast-feeding women)
 - 2.1.3 Management of toxic intoxication (use of antidotes)
 - 2.2. Non pharmaceutical toxic agents
 - 2.2.1 Alcohols toxicity (Ethanol, methanol, ethylene glychol)
 - 2.2.2 Metals toxicity (lead, arsenic, mercury, iron, copper)
 - 2.2.3 Toxic gases (carbon monoxide, phosgen, H₂S, HCN)
 - 2.2.4 Pesticides
 - 2.3. Acute pharmaceutical intoxication
 - 2.3.1 Psychotropic drugs (neuroleptic agents, TCA, antiepileptic agents)
 - 2.3.2 Cardiotropic drugs (B-blockers, Ca channel blockers)
 - 2.3.3 Analgesic drugs (Paracetamol, aspirin)

Lab section topics

- 1. General introduction in toxicology
- 2. Volatile toxic agents
 - 2.1 ethanol
 - 2.2 methanol
 - 2.3 chloroform,
 - 2.4 hydrogen cyanide
- 3. Evaporated toxic agents
 - 3.1 Phenol
 - 3.2 Nitrobenzene
 - 3.3 aniline
- 4. Toxic metals

Drug Synthesis Course

Forth year, first semester, 2 hours class and 2 hours lab

Class section topics

- 1. introduction
- 2. important chemical reactions
- 3. methods of drug synthesis
- 4. synthesis of lead compounds and analogues
- 5. synthesis of heterocyclic
- 6. combinatorial chemistry
- 7. spectroscopic methods
- 8. synthesis of some medical groups:
 - a. synthesis of beta-lactam antibiotics
 - b. synthesis of quinolones
 - c. synthesis of NSAIDs
 - d. synthesis of general anesthetics
 - e. synthesis of antihypertension drugs

Lab section topics

- general guidance
- basic operation in chemical synthesis: (extraction, recrystalization,..)
- synthesis of some drugs belonging to:
 - sulphonamids (sulphanilamid, sulphasalazine)

- aromatic amines (amphetamine)
- antiseptic halogens (chloroform)
- tetra ammonium derivatives (choline)
- phenols
- pyridine derivatives (nividipine)
- cycloheptadine derivatives (diazepam)
- coumarines derivatives
- pyrazole derivatives
- hydantoine derivatives
- separation of mixtures
- analyses of specters

Pharmacy Ethics and Legislations Course

Fourth year – First semester, 2 hours Class

- 1- Introduction to the history of medical sciences
- 2- Laws and legislations controlling the profession of pharmacy and medical material trade
- 3- Pharmacists Syndicate
- 4- Rights and duties of pharmacist
- 5- Pharmaceutical industry and its controlling laws
- 6- Continuous education

First Aid Course

Fourth year, First semester, 2 hours class

- Definitions and causes
- Vital signs
- transportation
- Cardio-pulmonary resuscitation
- Wounds and Bleedings
- Bone fractures
- Burns
- Acute abdominal pain
- Drugs injection

Food Chemistry and Control Course

Fourth Year, Second Semester, 2 hours class and 2 hours lab

Class Section Topics

1. Introduction to Food Chemistry and Control
2. Sampling and analytical methods
3. Food constitutes
4. Determination of Moisture and total solids
5. Determination of Ash in food

6. Determination of Ash content of metals
7. Determination of Vitamins in food
8. Determination of Protein in food
9. Determination of Carbohydrate in food
10. Determination of Total fatty substances in food
11. Physicochemical properties of fat
12. Oxidation of fatty substances in foods
13. Enzymes in food, enzymatic and non-enzymatic browning
14. Food additives and methods of analysis
15. Pollution and food poisoning
16. Food Processing Processes
17. Food preservation
18. Packing and packaging of food products
19. Some food products (chocolate, coffee, bakery, flour, bread, flour cheeses, milk and milk products, milk cheats and methods of detection, honey, honey screening and detection)

Lab Section Topics

1. Sampling and handling of chemicals
2. Determination of moisture in food
3. Determination of ash in food
4. Determination of minerals in the diets
4. Determination of carbohydrate content by physical and chemical methods
5. Determination of fat content
6. Identification of fatty substances (quality tests)
7. Determination of protein content
8. Determination of some vitamins in food
9. Detection of some chemical and biological contaminants in food
10. Detect some food additives
11. Detect some food cheats

Molecular Biology Course

Fourth year- second semester, 2 hours Class and 2 hours Lab

Class section topics

1. The molecular nature of genes:
 - DNA as heritable material.
 - DNA structure.
 - DNA replication.
 - Genome replication.
 - Chromosomes structure.
2. Gene expression:
 - Transcription of DNA to RNA.
 - RNA Polymerase.
 - DNA Polymerase.
 - Gene's regulatory elements.
 - Structure, function and biochemical properties of RNA.
 - Translation of RNA to protein.
 - Gene expression in Prokaryotes.
 - Gene expression in Eukaryotes.
3. Molecular Basis of Mutations:
 - Causes of mutations:
 - UV light.
 - Chemical agents.
 - Replication errors.
 - Mutations repair.
 - Effects of mutations on genetic information.
 - Effects of mutations on organisms.
4. Molecular biology methods:
 - Molecular cloning methods:
 - Molecular cloning.
 - Cloning vectors.
 - Restriction enzymes.
 - Cloning application.
 - DNA library.
 - Molecular Hybridization of nucleic acids (Blotting methods) and their applications.
 - Polymerase chain reaction PCR.
 - Production of recombinant proteins.
 - DNA sequencing.
 - human genome project.
5. Genes and diseases- gene therapy.

Lab section topics

1. Molecular nature of nucleic acid
 - DNA structure and function.
 - RNA structure and function.
 - DNA replication.
2. DNA transcription to RNA.
 - Transcription regulating factors.
 - RNA translation to protein.
3. Molecular techniques:
 - DNA cloning.
 - Polymerase chain reaction.

- Blotting methods and application.
 - Western blotting.
 - Northern blotting.
 - Southern blotting.
- 4. Recombinant protein production.

Community Pharmacy Course

Fourth Year, Second Semester, 2 hours Class

1- Introduction to Community Pharmacy

- Pharmacy Career according to New Concepts
- Pharmacist Role in Health Awareness
- Pharmacist Role in Promotion of Brochures and Medical Books
- Pharmacist Role in Using Medical Devices

2- Pharmacist and Public Health

- Pharmacist and Progeny Restriction
- Pharmacist and Drug Abusers
- Pharmacist and Handicapped Care
- Pharmacist and Drug Consumption Guide

3- Managing Symptoms in the Pharmacy

- Gastrointestinal Disorders
- Central Nervous System Cases
- Women Health
- Ear Conditions
- Skin Conditions
- Eye Conditions
- Pediatric Care
- Respiratory System Disorders
- Obesity and Diets

Forensic Toxicology Course

Forth year, second semester, 2 hours class and 2hours lab

Class section topics

1. Principles of forensic toxicology
 - 1.1 Postmortem forensic toxicology
 - 1.2 Human performance toxicology
 - Driving under influence
 - Workplace

- doping
- 1.3 Forensic drug testing
- 1.4 Pharmacokinetic and pharmacodynamic
- 1.5 Specimen Selection, Collection, Preservation, and Security
- 2. Common analytical Methods and Strategies for Toxicology Investigation
- 3. Common investigated drugs in forensic analysis and interpretation of results
- 3.1 Drugs of abuse
 - 3.1.1 Alcohols
 - 3.1.2 Controlled substances
 - Illegal drugs (depressants, stimulants, hallucinogens)
 - Therapeutic drugs (anticonvulsants, antidepressant and antipsychotic drugs)
- 3.2 Criminal poison
 - 3.2.1 Carbon monoxide, cyanide
 - 3.2.2 Inhalants
 - 3.2.3 Metals

Lab section topics

Non therapeutic Compounds

Alcohols : Quantitative analysis for alcohols in blood

- 1 . Ethanol
- 2 . Methanol, Pesticides and insecticides
- 3 . Detection of pesticides and insecticides in blood and some other samples

Metals

- 4 . Detection and determination of Lead Pb in blood and other samples

Therapeutic compounds

Drugs : Detection of some drugs in some biosamples (blood and urine) using coloring chemical reactions and thin layer chromatography .

5. Aspirin and Paracetamol
- 6 . Barbiturates
- 7 . Benzodiazepines
8. Dibenzazepines
- 9 . Phenothiazines

Alkaloids : Detection of alkaloids in samples

- 10 . Cholchicine , Codeine , Morphine , Atropine , Quinine , Strychnine

Industrial Pharmacy (2) Course

Fourth Year, Second Semester, 2 hours Class and 2 hours Lab

Class Section Topics

- 1- Quality Control and Good Manufacturing Practices
- 2- Different Departments of Pharmaceutical Factory
- 3- Processes before Manufacturing

- Water Treatment
- Air Treatment
- 4- Industrial Operations
 - Fragmentation of Solids
 - Separation and Mixing of Solids
 - Separation and Mixing of Liquids
 - Drying
 - Filtration and Centrifugation
- 5- Packaging and Labelling
- 6- Factors Affecting Drug Formulation
 - Stages of pharmaceuticals development
 - Study of Bulk characteristics
 - Study of Solubility characteristics
 - Study of Stability characteristics

Lab Section Topics

- 1- Preparation of Medical Shampoo
- 2- Preparation of Tooth Paste
- 3- Preparation of Nail Polish
- 4- Preparation of Nail Polish Remover
- 5- Preparation of Shaving Cream
- 6- Preparation of Cleaning Cream
- 7- Preparation of Lipstick
- 8- Preparation of Sunscreen
- 9- Preparation of Hair Fixing Gel

Scientific Writing Course

Fifth year, second semester, 2 hours class

1. Introduction on research methodology
2. Types of researches, references and searching using internet
3. Scientific papers: reading and analysis
4. Writing report
5. PowerPoint presentation
6. Domain of research
7. Defining the research problem
8. Research design
9. Methods of data Collection
10. Presentation of Results

11. interpretation of Results
12. how to write a scientific article and thesis
13. Software for references arrangement
14. writing of Curriculum vitae and Motivation letter

Physical Pharmacy Course

Fourth Year, Second Semester, 2 hours Class

- 1- Complexation
- 2- Solubility
- 3- Polymorphism
- 4- Drug Stability
 - 4-1- Stability tests
 - 4-2- Physicochemical Decomposition
 - 4-2- Kinetics of Drug Decomposition
 - 4-3- Stability Testing and Prediction of Shelf-life
- 5- Polymers and their Application in Drug Delivery
- 6- Physicochemical Drug Interactions and Incompatibilities
- 7 Peptide, Proteins and Other Biopharmaceuticals
- 8- In-vitro Assessment of Dosage Forms

Pathology Course

Fourth year – First semester, 2 hours class

- Introduction: Clinical examination
- Vital signs
- Infectious diseases
- Cardiovascular system diseases
- Urinary tract and kidney diseases
- Respiratory system diseases
- Digestive system diseases
- Hematological diseases
- Diabetes
- Thyroid diseases

Fifth year courses

First Term			
Course name	Weekly hours		
	Theoretical	Practical	Total
Clinical Biochemistry	2	2	2
Pharmaceutical Microbiology	2	2	2
Biopharmacy and Pharmacokinetics	2	2	2
Pharmaceutical Biotechnology	2	0	2
Training in Pharmacy	2	0	2
Research Project	2	2	2
Clinical Pharmacology	2	0	2
Communication Skills for Pharmacists	2	0	2
Total	16	8	16

Second Term			
Course name	Weekly hours		
	Theoretical	Practical	Total
Drug Quality Control	2	2	4
Medicinal Chemistry	2	2	2
Epidemiology and Public Health	2	0	2
Training in Pharmacy	2	0	2
Research Project	2	2	4
Nutrition and Dietary	2	2	4
Clinical Pharmacy and Hospital Pharmacy	2	2	4
Total	14	10	24

Clinical Biochemistry Course

Fifth year- first semester, 2 hours Class and 2 hours Lab

Class section topics

1. Introduction to general principles, units and samples in clinical lab.
2. Laboratory safety and quality assurance in clinical lab.
3. Enzymatic-radiologic immunoassay.
4. Clinical enzymology.
5. Pathogenesis of lipid metabolism- mechanisms of atherosclerosis.
6. Pathogenesis of proteins and amino acid metabolism.
7. Pathogenesis of hem metabolism and porphyria.
8. Pathogenesis of ions metabolism, acid-base balance, blood gases.
9. Plasma specific protein markers.
10. Pathological mechanisms of systems and organs:
 - 10.1. Liver and bile tract.
 - 10.2. Kidney and urinary tract.
 - 10.3. Body fluid analysis:
 - Cerebral spinal fluid.
 - Amniotic fluid.
 - Synovial fluid.
 - Sweat.
 - 10.4. Endocrine gland and hormones
 - 10.5. Diabetes Mellitus.
 - 10.6. Thyroid gland.

- 10.7. Gastrointestinal tract: stomach, pancreas and intestines.
- 10.8. Bone and connective tissues.
- 10.9. Heart and skeletal muscles.
- 10.10. Cancer, carcinogens and tumor markers.
- 10.11. Newborn metabolic hereditary disorders.

Lab section topics

1. Sample types (blood sample, sample collection), methods used in clinical chemistry.
2. Urine sample, properties and analysis.
3. Kidney function assessment.
4. Liver function assessment.
5. Heart function assessment.
6. Pancreas function assessment.
7. Glucose metabolism assessment.
8. Lipids and lipoproteins.
9. Uric acid level assessment.
10. Total protein measurement.
11. Immunity and immune assays.
12. Biologic fluid assessment.
13. Ion measurement.

Microbiological Pharmacy Course

Fifth year, first semester, 2 hours class and 2 hours Lab

- 1- Introduction to microbiological pharmacy
- 2- Pharmaceutical industry and microbiological organism
- 3- Quality assurance and bacterial risks control
- 4- Contaminations of pharmaceutical products
- 5- Preservatives and Conservation of Pharmaceutical Dosage Forms
- 6- Principles and methods of sterilization
- 7- Sterilization assurance and control
- 8- Water Activity
- 9- Biological tests of pharmaceutical products

Biopharmacy and Pharmacokinetics Course

Fifth Year, First Semester, 2 hours Class and 2 hours Lab

Class Section Topics

- 1- Biopharmacy and its Influence on drug efficacy
- 2- Pharmacokinetics and Pharmacodynamics
- 3- Bioavailability and Bioequivalence
- 4- Routes of Drug Administration
- 5- Passage of Drugs across Cell Membranes
- 6- Drug Absorption and Factors affecting on it
- 7- Drug Distribution and Factors Affecting on it
- 8- Drug Metabolism and Factors Affecting on it
- 9- Drug Excretion and Factors Affecting on it

Lab Section Topics

- 1- Study of the Drug Release from Tablets Prepared with Different Binders
- 2- Study of the Drug Release from Tablets Prepared with Different Lubricants
- 3- Study of the Drug Release from Tablets Vs. Capsules
- 4- Study of the Drug Release from Suppositories Prepared with Fatty Excipient Vs. Aqueous excipient
- 5- Study of the Drug Release from Sublingual Tablets
- 6- Study of the Drug Release from Dermal Preparations
- 7- Study of Accelerated Drug Degradation Using Temperature and Humidity
- 8- Study of Accelerated Drug Degradation in Liquid Pharmaceutical Forms
- 9- Problems in Pharmacokinetics

Pharmaceutical Biotechnology Course

Fifth year, first semester, 2 hours class

- 1- Introduction to Pharmaceutical biotechnology
- 2- Genetic engineering
- 3- Biopharmaceutical, Biologics and Biosimilars
- 4- Recombinant proteins production systems (Bacteria, yeast, insect cells, mammalian cells, genetic-modifying animals, genetic-modifying plants)
- 5- Formulation and quality control of Biopharmaceuticals
- 6- Production of pharmaceutically important materials (antibiotics, enzymes, some organic compounds)
- 7- Vaccines production
- 8- serum and antibodies (polyclonal antibodies, monoclonal antibodies)
- 9- Human genomes and gene therapy
- 10- Application of biotechnology in diagnostic of viral and microbial diseases
- 11- Application of Stem cells technology

Clinical Pharmacology Course

Fifth year- First semester, 2 hours class section

1. Pharmacological tests and prescription drugs.
2. Treatment of neurodegenerative diseases.
3. Treatment of mental and mood disorders.
4. Pain treatment.
5. Treatment of blood diseases.
6. Treatment of high blood pressure.
7. Treatments of Heart diseases.
8. Treatment of diabetes.
9. Treatment of digestive diseases
10. Treatment of respiratory diseases.
11. Treatments Infectious diseases
12. Anticancer Drugs.

Communication Skills for Pharmacists Course

Fifth year, first semester, 2 hours class

- 1- Caring and commitment
- 2- Developing the relationship
- 3- Choosing to see patients as people
- 4- Listening and sympathetic responding
- 5- Patient counseling
- 6- Managing the angry patient
- 7- Assertiveness
- 8- Conflict management
- 9- Helping patient with changing
- 10- Interacting with physicians
- 11- Choosing an appropriate response
- 12- Nonverbal languages
- 13- Communication on sensitive topics
- 14- Communication with patients who have literacy limitations
- 15- Communication with handicapped

Drug Quality Control Course

Fifth year, second semester, 2 hours class and 2 hours lab

Class section topics

- 1- Stages of testing and registration of new drugs
- 2- Quality management in pharmaceutical industry
- 3- Quality variables
- 4- Analytical development (validation, statistical treatment of results)
- 5- Sampling
- 6- Technological and physical laboratory:
 - Physical tests (viscosity, refraction index, melting point,...)
 - In process control and finished product tests:
 - Solid dosage forms
 - Semisolid dosage forms
 - Liquid dosage forms
 - Eye drops
 - Parenteral preparations
- 7- pharmacopoeia and monographs for raw material and dosage forms :
 - Organoleptic properties
 - Identification tests
 - Impurity tests

- Pharmacopoeial Indexes
- Quantitative analysis
- Separation techniques

8- Biological and microbiological laboratory:

- Sterility test
- Microbiological test
- Biological assay
- Pyrogen test
- Depressor Substances tests
- Abnormal and undue toxicity tests

9- packaging material tests

10- stability tests and good storage practices

11- Bioequivalence tests

12- quality control of some special products:

- Cosmetics
- Herbal medicines
- Compounding and magistrals
- Biologics and pharmaceuticals

Lab section topics

- Good laboratory practices
- Sample preparations and statistical treatment
- SOP : sections and writing
- Identification of active ingredient in dosage forms:
 - Sodium chloride in serum
 - Atropine sulfate tablet
 - Salicylic acid ointment
 - Aminoglycosides ointment
- Impurity tests:
 - Lead test in sucrose
 - Salicylic acid in aspirine
- Gravimetric and volumetric assay:
 - Assay of sodium chloride in serum
 - Assay of aspirin in tablets (acid base titration)
 - Nicotinamide tablet (non-aqueous titration)
 - Ascorbic acid syrup (Redox titration)
 - Zinc oxide ointment (complexometry titration)
 - Potassium chloride serum (argentimetry titration)
- Spectrophotometric assay:
 - Vitamine B2 tablet (visible specrophptometer)
 - Paracetamole tablet (UV specrophptometer)
- Chromatographic methods: diclofenac ampoule
- Physical tests:
 - Uniformity of weight of different dosage forms
 - Extrudability of creams
 - Tube leakage
 - Hardness and friability
 - Disintegration of enteric coated tablet
 - Disintegration of suppositories
 - Dissolution of Diazepam tablet
- Packaging material tests

Medicinal Chemistry Course

Fifth year second semester, 2 hours class and 2 hours lab

Class section topics

- Lead compounds sources
- Lead compounds Properties
- Structure activity relationship SAR:
 - Modification of size and shape of medicinal compound (extension, simplification, rigidification)
 - Role of functional groups in biological activity
 - cases study
- Quantitative structure activity relationship (QSAR)
- Principal Targets for drugs and their relation with drug design
- Studying of some model cases:
 - Design and development of antiulcer drugs
 - Design and development of antihyperlipidemia drugs (HMGR)
 - Design and development of central analgesics (opioids)
 - Design and development of antidepressants drugs
 - Design and development of adrenergic and cholinergic drugs
 - Design and development of antibiotics
 - Design and development of antiviral drugs
 - Design and development of anticancer drugs

Lab section topics

- calculation of Lipinski Rule for some medicines
- compound building using computational design software
- configuration and conformers
- virtual receptors
- creation of database for compounds
- choosing of hits from databases
- downloading the chemical structure from internet
- docking

Epidemiology and Public Health Course

Fifth year, second semester, 2 hours class

Class section topics

Epidemiology

1. General principles of Epidemiology
 - 1.1 Definitions
 - 1.2 Type of epidemiological studies
 - 1.3 Infectious disease process
 - 1.4 Epidemiologic concepts
 - 1.5 Epidemiologic variables
 - 1.6 Investigation of epidemic
2. Epidemiology and prevention of selected acute illness
 - 2.1 Control and prevention
 - 2.2 Immunobiologic agents
 - 2.3 Measles and influenza
 - 2.4 Cholera, brucellosis and typhoid fever
 - 2.5 Sexually transmitted disease
 - 2.6 Viral hepatitis

- 2.7 Tuberculosis
- 2.8 Meningitis
- 3. Epidemiology and prevention of selected chronic illness
 - 3.1 Coronary heart disease
 - 3.2 Cancer
 - 3.3 Cerebrovascular disease
 - 3.4 Chronic obstructive pulmonary disease
 - 3.5 Cirrhosis
 - 3.6 Diabetes
 - 3.7 Anemia

Public health

- 1. Environment
 - 1.1 Physical environment
 - 1.2 Socio-economical environment
- 2. Human host
- 3. Agent of disease
- 4. Environmental pollution
- 5. Medical waste
- 6. Sanitary house
- 7. Food contamination and food sanitation
- 8. Milk sanitation
- 9. Maternal health issues
 - 9.1 Methods of family planning
 - 9.2 Preterm termination of pregnancy
 - 9.3 Prenatal care and screening
- 10. Health of newborn

Nutrition and Dietary Decision Course

Fifth Year, Second Semester, 2 hours class and 2 hours lab

Class Section Topics

- 1. Introduction to nutrition science.
- 2. Major and minor nutrients (importance and daily need)
- 3. Calories in food and determine the daily energy necessary for the individual.
- 4. Nutrition during the different age ranges (pregnant, nursing, infant, child, adolescent, adult and elderly)
- 5. The basic reference points for a healthy diet (DRIs, Food models, Nutrition fact, Exchange lists for healthy food)
- 6. Food labelling card
- 7. Nutritional supplements
- 8. Functional food
- 9. Nutritional disorders
- 10. Dietary diets for metabolic diseases (diabetes and others diseases)
- 11. Dietary diets for respiratory diseases
- 12. Dietary diets for heart disease, pressure and cholesterol

13. Dietary diets for upper and lower gastrointestinal diseases
14. Dietary diets for liver and kidney diseases
15. Food allergies and food intolerance

Lab Section Topics

1. The use of various methods to measure obesity: hairy body mass, waist ratio to weight and hair mass body, skin thickness, fatty mass and muscle mass.
2. Determination of daily energy needed for the individual.
3. Determination of the energy in the diets
4. Writing and evaluating the food protocol.
5. Dietary Alternatives and Diabetes
6. Dietary and therapeutic diets for some diseases
7. Diets and diets for athletes
8. Food systems and diets in different age groups
9. Determination of the contents of some food products and their conformity with food label information
10. Study the effect of different cooking processes on nutritional value and energy in food
11. Studying the effect of different food preservation and packaging operations on nutritional value and energy in food
12. Statistical study of dietary diets in some cases and their impact on the improvement of health status

Clinical Pharmacy and Hospital Pharmacy Course

Fifth Year, Second Semester, 2 hours Class and 2 hours Lab

Class Section Topics

- 1- Definition of Clinical Pharmacy and the Purpose of its Studying
- 2- Pharmacokinetics
- 3- Drug-Drug Interactions
- 4- Drug Adverse Reactions
- 5- Laboratory Data Studying: The Biochemical and Biological Changes
- 6- Drug and Life Stages: Neonates, pediatrics, Geriatrics
- 7- Drugs used in Pregnancy and Lactation
- 8- Treatment of the Most Common Diseases
- 9- Obesity Treatment
- 10- Cancer Treatment

Lab Section Topics

1- Problems in Different Clinical Cases: Ulcer, Hypertension, Asthma, Diabetes, Obesity, Cancer

2- Problems in Clinical pharmacokinetics:

- Oral administration
- Intravenous administration
- Venous Infusion
- Repeated Administration