

Department of Chemistry

: Vision

Achievement of leadership in academic programs, research and community services in drug design, development and evaluation.

: Mission

The department of chemistry is committed to academic excellence in the quality of education, research and community services, through providing and disseminating a comprehensive and progressive understanding of the chemical and biological concepts of drug action and drug evaluation, in accordance with the recent development in drug science and technology.

: The department teaches the following courses:

Course Code	Course Name
PHC 101	General Chemistry
PHC 102	Physical Chemistry
PHC 103	Pharmaceutical Analytical Chemistry (1)
PHC 111	Pharmaceutical Organic Chemistry (1)
PHC 112	Pharmaceutical Organic Chemistry (2)
PHC 204	Pharmaceutical Analytical Chemistry (2)
PHC 205	Instrumental Analysis
PHC 321	Pharmaceutical Chemistry (1)
PHC 422	Pharmaceutical Chemistry (2)
PHC 423	Drug Design
PHC 506	Quality Control of Drugs

: The department Supervises teaching the following courses:

Course Code	Course Name
COM 100	Computer Science
MAT 100	Mathematics

Laboratories of Chemistry Department			
Laboratory	Lab no.	Floor	Location
Preparation Room	2101	First	Saad Zaghoul Building
1	2102		
2	2103		

3	2104		
4	2105		
Preparation Room	2334-C	Third	Salah Al-din Building
1	2334 -A		
2	2334-B		
3	2342		

: Course description:

First Level

1- First Semester

Code	PHC 101	Credit hours		
Title	General Chemistry	L*	P/T**	Total
Pre-requisite	None	1	1	2

Course content:

This course covers the following:

- Introduction to qualitative inorganic analysis - Theoretical aspects of electrolytic dissociation theory, law of mass action, ionization constant, ionic equilibrium, common ion effect, solubility product constant K_{sp} .
- Reactions of anions -Dry reaction, wet reactions, parent acids classification of anions into groups (carbonate, sulphur, halides, cyanogens, phosphorous, arsenic and nitrogen containing anions).
- Qualitative analysis of cation -Systematic separation of cations, classification of cations into groups according to solubility, group reagents for systematic separation of mixed basic radical and flame test for certain metal ions.

Code	PHC 102	Credit hours		
Title	Physical Chemistry	L*	P/T**	Total
Pre-requisite	None	1	-	1

Course content:

This course describes the attraction between molecules: types of bonds, matter, measurements, and units, gases, chemical equilibrium, acids, bases and acid-base equilibria, solutions and chemical kinetics.

Code	PHC 111	Credit hours		
Title	Pharmaceutical Organic Chemistry (1)	L*	P/T**	Total
Pre-requisite	None	3	1	4

Course content:

This course includes introduction, nomenclature, theoretical and practical study of aliphatic, aromatic and polynuclear hydrocarbons, halogenated compounds, alcohols, phenols, ethers, carbonyl compounds, amines, carboxylic acids and their derivatives.

Code	MAT 100	Credit hours		
Title	Mathematics	L*	P/T**	Total
Pre-requisite	None	1	-	1

Course content:

This course covers differentiation & integration, linear algebra, dilution, pharmacokinetics, isomer enumeration, energy levels and molecular orbitals.

Code	COM 100	Credit hours		
Title	Computer Science (University requirement)	L*	P/T**	Total
Pre-requisite	None	1	1	2

Course content:

- Introduction.

- The system unit: Processing and memory.
- Storage: Types of storage systems.
- Input and output.
- System software: Operating systems and utility programs.
- Applications software.
- Computer network: Types and applications.

First Level

2- Second Semester

Code	PHC 103	Credit hours		
Title	Pharmaceutical Analytical Chemistry (1)	L*	P/T**	Total
Pre-requisite	General Chemistry, Physical Chemistry	2	1	3

Course content:

This course covers quantitative volumetric analysis, introduction to analytical titration methods:

- Neutralization reactions in aqueous medium -Acid base titration theories, law of mass action, hydrogen ion exponent (pH), buffer solutions, neutralization titration curves, application of neutralization reactions, neutralization reactions in non-aqueous titration.
- Complex formation titrations - Ligands: mono- and multi-dentate ligands, factors affecting stability of complexes, titration curves and metallic indicators, types of EDTA titrations, non EDTA titration applications in pharmaceutical laboratories.
- Precipitometry- Solubility product rule, factors affecting solubility of a precipitate, titration curves in precipitation reactions, applications of Precipitometry.

Code	PHC 112	Credit hours		
Title	Pharmaceutical Organic Chemistry (2)	L*	P/T**	Total
Pre-requisite	Pharmaceutical Organic Chemistry (1)	3	1	4

Course content:

This course includes:

- Stereochemistry: isomerism, stereoisomers, optical isomers, geometrical isomers and stereo chemical reactions.
- Heterocyclic chemistry: nomenclature, synthesis and properties of five, six and seven membered rings and nomenclature of fused heterocyclic rings.
- Spectroscopy: ultra violet, infra red, nuclear magnetic resonance (H-NMR) and mass spectroscopy concept and use in analysis.

Second Level

1- First Semester

Code	PHC 204	Credit hours		
Title	Pharmaceutical Analytical Chemistry (2)	L*	P/T**	Total
Pre-requisite	Pharmaceutical Analytical Chemistry (1)	2	1	3

Course content:

This course covers the following:

- Oxidation and reduction reactions: Equivalent weights of oxidant and reductant, permanganometric titrations, Iodimetric and iodometric redox titrations, Applications of redox reactions.
- Electrochemical methods of analysis: Overview of electroanalytical techniques, Potentiometry, nature of electrode potential and Nernst equation, Reference and indicator electrodes, Conductometry.
- Introduction to gravimetric analysis: Conditions of precipitation and various gravimetric steps, purity and contamination of the precipitate, calculations and practical gravimetry, applications of gravimetry e.g. determination of Ca^{2+} , Cu^{2+} , SO_4^{2-} and Cl^- .

Second Level

2- Second semester

Code	PHC 205	Credit hours		
Title	Instrumental Analysis	L*	P/T**	Total

Pre-requisite	Pharmaceutical Analytical Chemistry (2)	2	1	3
Course content:				
This course covers the following:				
I- Spectrophotometry				
<ul style="list-style-type: none"> - UV & VIS: Light and radiation, electromagnetic spectrum, interactions of photon with matter, electronic transitions, chromophores, auxochromes, bathochromic & hypsochromic shifts/hyperchromic and hypochromic effects, absorption characteristics of chromophores, effect of pH on absorption spectra, Beer's- Lambert's law, colorimetry, standard series method and varying depth method, photoelectric instruments, applications (qualitative & quantitative). 				
II- Spectrofluorometry				
<ul style="list-style-type: none"> - Principle, fluorescence, phosphorescence, chemical structure and fluorescence, quenching, instruments, applications. - Atomic absorption and flame emission: principle, excitation sources (Flame, non-flame excitation/Hollow cathode lamp (a-plasma, b-laser, c-arc and spark), flame emission, atomic absorption, atomic fluorescence spectroscopy, theory, Instrumentation, applications. 				
III. Representative pharmaceutical applications.				

Third Level

2- Second semester

Code	PHC 321	Credit hours		
Title	Pharmaceutical Chemistry (1)	L*	P/T**	Total
Pre-requisite	Pharmaceutical Organic Chemistry (2)	2	1	3
Course content:				
This course covers β -Lactam antibiotics, non β -Lactam antibiotics, sulphonamides, antimalarial agents, antifungal agents, antiprotozoal agents, anthelmintic & antibilharzial agents and antiseptic and disinfectant agents. Anti T.B. and antileprotic agents, antiviral agents and antineoplastic drugs. Drug metabolism, drug design chemical purity and pharmaceutical analysis of some of the studied				

drugs. Titrimetric, spectrophotometric application for some of the selected drugs, in addition to drug identity.

Fourth Level

1- First semester

Code	PHC 422	Credit hours		
Title	Pharmaceutical Chemistry (2)	L*	P/T**	Total
Pre-requisite	Pharmaceutical Chemistry (1)	2	1	3

Course content:

This course covers the following: Non steroidal anti-inflammatory analgesic drugs & narcotic analgesics, cardiovascular system drugs (anti-hypertensive, anti-anginal, anti-arrhythmic, anti-hyperlipidemic, anti-coagulants, haemostatics (anti-fibrinolytics), cardiotonic, insulin and hypoglycemic drugs, thyroid hormones and antithyroid drugs). Diuretics, local anaesthetics. H₁ & H₂ antagonists and PPI. CNS depressants (sedative and hypnotic agents, anxiolytic, central skeletal muscle relaxant, anticonvulsant or antiepileptic drugs, antipsychotic drugs [neuroleptics] and general anesthetics). CNS stimulants (Analeptics, central sympathomimetics-psychomotor stimulant). Drugs used for treatment of obesity, Parkinsonism therapy, Alzheimer therapy and anti-depressant drugs. Steroidal hormones (sex hormones and corticosteroids). Vitamins, antioxidants and diagnostic Agents. Monographs of pharmaceutical compounds: (Analysis and purity tests).

Fourth Level

2- Second semester

Code	PHC 423	Credit hours		
Title	Drug Design	L*	P/T**	Total
Pre-requisite	Pharmaceutical Chemistry (2)	1	1	2

Course content:

This course includes the following: The drug discovery process from the beginning until the final stages of clinical trials. The various stages of identifying and selecting a target, a lead compound and carrying out the in vivo testing to determine biological activity and/or toxicity and evaluating acceptable "drug-like properties".

Fifth Level**1- First semester**

Code	PHC 506	Credit hours		
		L*	P/T**	Total
Title	Quality Control of Drugs			
Pre-requisite	Biotechnology, Medical Microbiology and Immunology, Chromatography and Separation Techniques	2	1	3

Course content:

This course covers the following:

Analytical quality control:

Introduction. Definition of QC & QA. GLP & GAP. Drug standards and sampling. Development of analytical control of laboratories. Documentation. Analytical method of validation. Reference standards. Drug stability and stability indicating methods (degradation stability of drug and chemical degradation routes). Analytical methods for assessment of Q.C. and aspects of some pharmaceutical products.

Microbiological quality control:

Microbial contamination of pharmaceutical products. Microbiological control of sterile and non-sterile products. Evaluation of antimicrobial chemotherapeutic agents, disinfectants, antiseptics and preservatives. Microbiological assay of antibiotics by different methods (e.g. agar diffusion and turbidimetric methods etc).

Herbal quality control:

Introduction to herbal quality control, morphological standards, pharmacopeal constants, determinations of active constituents (saponin, tannin, mucilage etc.) and potential contaminants

(pesticide residues, microbial toxins and heavy metals).

- **Elective Courses:**

Code	PHC 600	Credit hours		
Title	Advanced Instrumental Analysis	L*	P/T**	Total
Pre-requisite	Instrumental analysis	2	1	3

Course content:

Electrophoresis, HPLC, Voltammetry, GC, ISE, Polarommetry & Refractometry.

Code	PHC 601	Credit hours		
Title	Computer Aided Drug Design	L*	P/T**	Total
Pre-requisite	Drug Design	1	1	2

Course content:

This course includes the following:

- Introduction: Course Objectives and ILO's.
- Molecular Modeling and Computer-Aided Drug Design.
- Protein, Nucleic Acid Structure and Modeling
- Rational Drug Design from Enzyme Inhibitors
- Molecular Modeling Laboratory
- Design and Delivery of Nucleic Acid Drugs
- Quantitative Structure Activity Relationships.