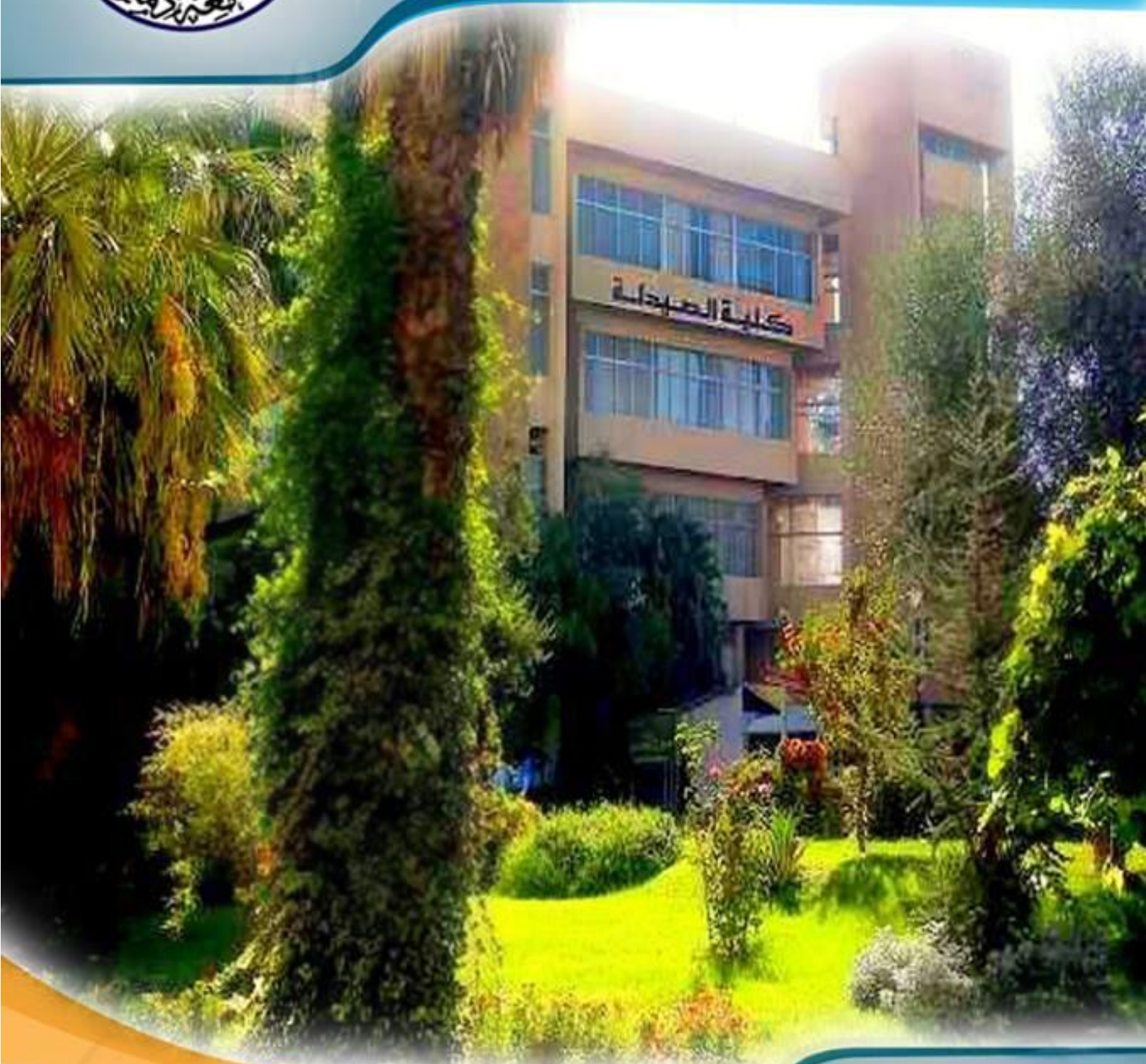




Damascus University Faculty Of Pharmacy



Study Guide Of The Faculty Of Pharmacy





Dr. Bashar Al-Assad

President of Syrian Arab Republic

PREFACE

Damascus University is not only one of the largest universities in the Syrian Arab Republic, but also the oldest. It goes back to the early twentieth century when it has raised and still raising the banner of thought, science, and knowledge without hesitance or apathy.

Faculty of pharmacy at Damascus University is one of the pioneer institutions in the Arab world in pharmacy and pharmaceutical sciences. Staring from there, we are obligated to offer our students whatever's needed so they continue to be a beacon of knowledge everywhere they go around the globe.

In this study guide (English version, second edition), we are keen to put between your hands this detailed syllabus of both theoretical and practical parts throughout 5 years of studies. Hopefully this guide will help our students to set their path into being real ambassadors for Syria, to continue their studies abroad, and to achieve their goals without any obstacles.

Finally, we would like to thank all individuals who had participated and contributed to the accomplishment of this guide:

- Professor Dr. Abdul – Hakim Nattouf Dean of the Faculty of Pharmacy
- Professor Dr. Mustafa Al-Amouri Vice dean for scientific affairs
- Professor Dr. Jumana Saleh Vice Dean for Administrative and Students Affairs
- Professor Dr. Faizeh Al-Quobaili
- Professor Dr. Hind Al-Zain
- Dr. Lama Yousef
- Dr. Majd Jamali
- Dr Samar Al- Zeer
- Teaching assistant Basema Arous
- Teaching assistant Ranim AlRouhayyah
- Pharmacist Alaa Al-Shiekh Mohammad
- Pharmacist Sami Chalhoub
- Mr. Ahmed AlAloush Office Manager - Dean office

We hope that we achieve our objectives, wishing our country Syria safety and peace .

Damascus in 01/12/2016

Dean of the Faculty of Pharmacy - Damascus University

Professor Dr. Abdul – Hakim Nattouf

PREFACE

Our students have always been real ambassadors for the Syrian Arab Republic in the world, especially in the European countries and USA, through pursuing their education and leaving good impacts wherever they are. Therefore, we ought to provide them with all help needed and support them in their scientific path.

Perhaps the first step in this path is to supply them and their supervisors with the study plan in the Faculty of Pharmacy in order to be an accurate reflection to the knowledge they already have and to which they seek to improve. Hence, we deliver to them the English version of the Faculty of pharmacy guide including a precise description of the syllabus of both the theoretical and practical parts to be the title of their scientific progress during their five years in the faculty.

Although the English version came long after issuing the Arabic version, but it remains a desirable goal for our students, hoping that this guide is beneficial to all of them.

In conclusion, we would like to thank all individuals who contributed to the accomplishment of this guide:

- Professor Dr. Sahar Al-Fahoum Vice dean for scientific affairs
- Dr. Lama Yousef
- Dr. Mohammad Ameen Mohammad
- Dr. Marwan Bohturi
- Dr. Majd Jamali
- Dr Samar Al- Zeer
- Teaching assistant Basema Arous
- Teaching assistant Hala Shiekh Ahmad
- Teaching assistant Ranim AlRouhayyah
- Pharmacist Alaa Al-Shiekh Mohammad

We hope that we achieve our objectives, wishing our country Syria safety and peace .

Damascus in 9/10/2013

Dean of the Faculty of Pharmacy - Damascus University

Professor Dr. Joumaa Al-Zehouri

Study Plan

- Complying with the regulation of the University Military Training course, the study plan of the Bachelor stage is determined as following:

First Year:

First Semester				Second Semester			
Course's name	Number of weekly hours			Course's name	Number of weekly hours		
	Class sessions	Lab sessions	Total		Class sessions	Lab sessions	Total
Cell Biology	3	2	5	Introduction To Pharmacy	2	-	2
General and Inorganic Chemistry	3	3	6	Organic Chemistry (1)	3	3	6
Anatomy	2	2	4	Botanical Biology	3	2	5
Arabic Language	2	-	2	Physiology	2	-	2
Foreign Language (1)	4	-	4	Foreign Language (2)	4	-	4
Mathematics	2	-	2	Socialist National Education	2	-	2
				Physics	2	3	5
Total	16	7	23	Total	18	8	26

Second Year:

First Semester				Second Semester			
Course's name	Number of weekly hours			Course's name	Number of weekly hours		
	Class sessions	Lab sessions	Total		Class sessions	Lab sessions	Total
Pharmaceutics (1)	2	2	4	Pharmaceutics (2)	2	2	4
Pharmacology (1)	3	-	3	Pharmaceutical Analytical chemistry (1)	3	3	6
Pharmaceutical Physical Chemistry	2	3	5	Biochemistry (1)	3	3	6
Organic Chemistry (2)	3	3	6	Drug Synthesis	3	3	6
Computer and its Applications in Pharmacy	2	2	4	Biostatistics	2	-	2
Foreign Language (3)	4	-	4	Foreign Language (4)	4	-	4
Total	16	10	26	Total	17	11	28

Third Year:

First Semester				Second Semester			
Course's name	Number of weekly hours			Course's name	Number of weekly hours		
	Class sessions	Lab sessions	Total		Class sessions	Lab sessions	Total
Pharmaceutical Technology	3	3	6	Pharmacognosy and Pharmacognostical Chemistry (2)	3	3	6
Pharmacognosy and Pharmacognostical Chemistry (1)	3	3	6	Pharmaceutical Chemistry (1)	3	3	6
Pharmaceutical Analytical chemistry (2)	3	3	6	Bacteriology and Virology (2)	2	3	5
Hematology and Immunology	3	3	6	Pharmacology (2)	3	3	6
Biochemistry (2)	3	-	3	Preparation and Control of Pharmaceutical dispense	4	-	4
Bacteriology and Virology (1)	2	-	2				
Total	17	12	29	Total	15	12	27

Forth Year:

First Semester				Second Semester			
Course's name	Number of weekly hours			Course's name	Number of weekly hours		
	Class sessions	Lab sessions	Total		Class sessions	Lab sessions	Total
Industrial Pharmacy (1)	2	3	5	Molecular Biology	2	2	4
Pharmacology (3)	3	3	6	Industrial Pharmacy (2)	2	3	5
Pharmaceutical Chemistry (2)	3	3	6	Community Pharmacy	2	-	2
Applied Pharmacognosy	2	3	5	Toxicology	4	3	7
First Aid	2	-	2	Pathology	2	-	2
Media, Marketing and Economy in Pharmacy	2	-	2	Pharmacy History Ethics and Legislations	2	-	2
Pharma codynamic and Clinical Pharmacy (foreign language)	4	-	4	Scientific Writing and Research Methods	2	-	2
-	-	-	-	Pharmaceutical Analytical chemistry (2)	3	3	6
Total	18	12	30	Total	19	11	30

Fifth Year:

First Semester				Second Semester			
Course's name	Number of weekly hours			Course's name	Number of weekly hours		
	Class sessions	Lab sessions	Total		Class sessions	Lab sessions	Total
Clinical and Hospital Pharmacy	3	3	6	Biotechnology in Pharmacy	2	-	2
Occupational and Forensic Toxicology	2	-	2	Biopharmacy and Pharmacokinetics	3	3	6
Nutrition and Diets	1	-	1	Food Chemistry and Control of Food	4	3	7
Clinical Biochemistry	3	3	6	Parasitology and Mycology	3	2	5
Pharmaceutical Microbiology	2	3	5	Medicinal Chemistry	2	3	5
Quality Control of Drugs	3	3	6	Public Health and Environment Pollution	2	-	2
-	-	-	-	Basis of Laboratory Diagnosis (foreign language)	4	-	4
-	-	-	-	Apprenticeship	2	-	2
-	-	-	-	Graduation Project	2	-	2
Total	14	12	26	Total	24	11	35

- By complying with the rules of executive regulations of Universities Organization Act regarding the number of courses in each academic semester at the Bachelor stage for the University Senate, upon the suggestion of the Faculty Senate, it is allowed to transfer the teaching of and course from one semester to another.

Details of Pharmaceutics and Pharmaceutical Technology
Department Courses

A. Pharmaceutics (1) Course (first year- second semester):

Class Section Topics:

1. Introduction to Pharmaceutical sciences:
 - 1.1. General Definitions: medicine, treatment, poison and drug.
 - 1.2. Raw material, Pharmaceutical dosage form, Pharmaceutical preparation.
 - 1.3. Bioavailability and bioequivalence.
2. Sources of drugs:
 - 2.1. Identification of drugs.
 - 2.2. Drugs and their roles in diseases protection and treatment. Progression of treatment method.
 - 2.3. Development of treatment methods.
 - 2.4. Pharmacist roles in drug selection and progression.
3. Drugs classification: Pharmacopoeial medicines, descriptive medicines, antibody drugs, homeopathic medicines.
4. Drug quality control:
 - 4.1. Criteria of superior medicinal compound.
 - 4.2. Standards and quality of drugs, pharmacopeia, national formulary.
 - 4.3. Rules of good Pharmaceutical practice, good manufacturing practice, good storage practice, good analysis practice, etc.
5. Drug administration routes:
 - 5.1. Release, absorption, distribution, and excretion of drugs.
 - 5.2. Drug absorption principles.
 - 5.3. Physiological and anatomical factors.
 - 5.4. Physical and chemical factors.

- 5.5. Drug interaction factors: food-drug, drug-drug, metabolism, diseases, age.
6. Drug doses.
7. Drug weighing scales.
8. Development of pharmaceutical dosage forms:
 - 8.1. Identification of delivery systems.
 - 8.2. Traditional pharmaceutical dosage forms.
 - 8.3. Modern pharmaceutical dosage forms.
 - 8.4. Programmed release pharmaceutical dosage forms.
9. Medicine prescription: regular prescriptions, narcotic drug prescriptions, Psychologic drugs prescriptions.
10. Drug labeling.
11. Drug packaging and wrapping.
12. Drug storage.
13. Pharmaceutical dosage forms and operations:
 - 13.1. Pharmaceutical galenic forms.
 - 13.2. Dissolving procedures, solutions.
 - 13.3. Extraction procedures, extracts, tinctures.
14. The most important excipients and auxiliary agents: Diluents, natural and synthetic flavoring agents, coloring agents, preservatives, sweetening agents.

Lab Section Topics:

1. Introduction to Pharmacopoeia.
2. Introduction to some medicinal materials, excipients, and their physical characteristics.
3. Introduction to some Pharmaceutical procedures by preparation of:
 - powder mixtures
 - Effervescent powders.
4. Preparation of powder Pharmaceutical forms (Patches, capsules, rivets).

5. Introduction to simple solutions (aqueous solutions and oleaginous solutions) and preparation:
 - Iodine alcoholic solution
 - Iodine povidone solution
 - Maniza lemon solution.
6. Preparation of gargles: aromatic mint spirit gargle, study of gargles available in pharmacies.
7. Preparation of washes: caladryl wash, benzyl benzoate wash, calamine wash.
8. Preparation of paints: borax and salicylic acid paint.
9. Preparation of mucilages: arabic gum (acacia Senegal), tragacanth, gelatin, and starch.
10. Glycerides: starch glyceride.
11. Pastes: zinc oxide paste, Ichthyolpaste (with oleaginous base).
12. Alcoholic degree identification.
13. Extraction: glycerhizza root extraction, lemon flower extraction, thyme extraction.
14. Preparation of tinctures, semi-solid extracts, dry extracts.

B. Pharmaceutics (2) Course (second year- first semester):

Class Section Topics:

1. Liquid forms:
 - 1.1. Syrups and oral drops.
 - 1.2. Otic and nasal drops.
2. Dispersion systems:
 - 2.1. Rheology.
 - 2.2. Emulsions.
 - 2.3. Micellar solutions and micro emulsions.
 - 2.4. Suspensions.
 - 2.5. Liposomes.

2.6. Aerosols.

3. Eye drops.

4. Injection forms.

Lab Section Topics:

1. Preparation of syrup with plant extract.

2. Preparation of syrup with one medicinal material.

3. Preparation of syrup with multiple medicinal materials.

4. Preparation of syrup with slightly soluble medicinal material.

5. Preparation of oral drops.

6. Preparation of nasal drops.

7. Preparation of otic drops.

8. Preparation of magnesium hydroxide suspension.

9. Preparation of succinyl sulfathiazole suspension.

10. Preparation of emulsion using dry gum.

11. Preparation of suspension using wet gum.

12. Preparation of medicinal emulsion containing agar as an auxiliary agent.

13. Preparation of W/O emulsion.

14. Preparation of emulsion using synthetic emulsifying agents.

15. Preparation of semi-solid O/W emulsion.

16. Preparation of O/W emulsion.

17. Preparation of isotonic drops with specific acidity degree.

18. Preparation of physostigmine and pilocarpine drops.

19. Preparation of adrenaline injection solution.

C. Media, Marketing and Economy in Pharmacy Course (second year-first semester):

Introduction:

1. Systems of pharmaceutical management and services.
 - 1.1. Systems of pharmaceutical management in west European countries and America.
 - 1.2. Systems of pharmaceutical management in Syria.
2. Pharmaceutical economic planning.
3. Pharmaceutical organizing:
 - 3.1. Regulation of pharmacy practice.
 - 3.2. Regulation of drug prescription.
 - 3.3. Regulation of narcotic prescriptions.
 - 3.4. Regulation of drug labeling and packaging.
 - 3.5. Regulation of drugs and pharmaceutical forms storage.
4. Pharmaceutical control:
 - 4.1. Quality control of medicinal preparations.
 - 4.2. Quality control of nutritional preparations.
 - 4.3. Quality control of equipment and medical instruments.
5. Pharmaceutical Media:
 - 5.1. Pharmaceutical Media for medicinal preparations.
 - 5.2. Pharmaceutical Media and Marketing.
 - 5.3. Media in Society Service.
 - 5.4. Media and clinical treatment.
6. Drugs registration and Pharmaceutical marketing.
7. Pharmaceutical economic accounts:
 - 7.1. Statistical accounts.
 - 7.2. Commercial accounts.
 - 7.3. Double entry accounting.

7.4. Purchase and selling processes.

7.5. Transactions ledger.

7.6. Review scale.

7.7. Final accounts and general Budget.

D. Computer and its Applications in Pharmacy Course (second year-second semester):

Class Section Topics:

Introduction:

- First Chapter: Information systems
 1. Information systems in decision making service.
 2. Scientific documentation systems.
 3. Information systems of chemical substances, drugs and poisons.
 4. Systems of private documents.
 5. Financial information systems.
 6. Archive Automation Systems.
- Second chapter: Computer and applied sciences.
 1. Computer and basic sciences.
 2. Computer and medical sciences.
 - 2.1. Computer and information exchange.
 - 2.2. Computer and general health.
 3. Computer and pharmaceutical sciences:
 - 3.1. Pharmaceutical formulations.
 - 3.2. Indications and drug action.
 - 3.3. Biopharmacy and pharmacokinetics.
 - 3.4. Side effects and contraindications.
 - 3.5. Drug interactions.
 - 3.6. Precautions of API and excipients.

3.7. Dosing and administration.

- Third chapter: Computer and scientific research.

1. Scanning for information.
2. Data collection.
3. Data processing and statistical importance.
4. Data presentation.
5. Data validation and ethics.

- Fourth chapter: Computer and its professional applications.

1. Computer and hospital pharmacy.
2. Computer and industrial production.
3. Computer and medical laboratories.
4. Computer and private pharmacies.
5. Computer and storage.

- Fifth chapter: Computer and Internet.

1. E-mail.
2. Internet & pharmaceutical and medical media.
3. Medical websites.
4. Free websites for searching.
5. Sign up for scientific Websites.

- Sixth chapter: Website design and benefits.

Lab Section Topics:

1. Introduction to the computer and Windows software.
2. Microsoft word program.
3. Microsoft excel program.
4. Microsoft access program.
5. Microsoft PowerPoint program.
6. Microsoft outlook program.

7. Introduction to some programs used for:

- Hospital pharmacy and drug warehouses.
- Medical laboratories.
- Private pharmacies.
- Factories and industrial section.
- Treatment and drug affairs.

8. Biostatistic programs SPSS.

9. Corel programs.

10. Internet and scientific research.

E. Pharmaceutical Technology(1) Course (third year- first semester):

Class Section Topics:

1. Pills and pellets.

2. Tablets: sugar tablets, moulded tablets.

3. Granules.

4. Compressed tablets:

4.1. Uncoated compressed tablets: Preparation methods, common excipients, tablet compression machine, tablet types, tablet quality control.

4.2. Coated compressed tablets:

A- Sugar coating: coating process, equipments, quality control of sugar coating.

B- Thin layer film coating:

- Enteric coating, gastric coating
- thin layer coating excipients, film generating polymers, solvents, plasticizers, bulking powders, coloring agents
- preparation method
- Film coating quality control.

5. Prolonged and controlled release solid pharmaceutical dosage forms: Controlled release techniques, controlled release processes.

Lab Section Topics:

1. Pills and pellets:
 - 1.1. Preparation of pills containing plant extracts.
 - 1.2. Preparation of pills containing plant powders.
 - 1.3. Preparation of pills containing reacting chemical compounds.
 - 1.4. Preparation of digitalin pellets.
2. Sugar tablets: preparation and quality control of sugar tablets.
3. Granules:
 - 3.1. Preparation of sugar granules.
 - 3.2. Preparation of effervescent granules.
 - 3.3. Preparation of granules used in produce tablets.
4. Compressed tablets:
 - 4.1. Preparation of compressed tablets via direct compression.
 - 4.2. Preparation of compressed tablets via dry granulation.
 - 4.3. Preparation of compressed tablets via wet granulation.
 - 4.4. Preparation of effervescent compressed tablets.
 - 4.5. Preparation of chewable compressed tablets.
 - 4.6. Preparation of lozenges.
 - 4.7. Preparation of compressed vaginal tablets.
 - 4.8. Quality control of compressed tablets.
5. Coated compressed tablets:
 - 5.1. Preparation of sugar coated compressed tablets.
 - 5.2. Preparation of gastric film coated compressed tablets.
 - 5.3. Preparation of enteric film coated compressed tablets.
 - 5.4. Quality control of coated compressed tablets.
6. Prolonged release compressed tablets:
 - 6.1. Preparation of prolonged release compressed tablets.
 - 6.2. Quality control of prolonged release compressed tablets.

F. Pharmaceutical Technology (2) Course (third year-second semester):

Class Section Topics:

I. Dermal preparations:

1. Structure of skin and drug absorption through it.
2. Criteria and classification of excipients.
3. The most important raw materials used in dermal preparations.
4. Preparing and packaging of dermal preparations.
 - 4.1. Aqueous gels.
 - 4.2. Hydrophobic fatty ointments.
 - 4.3. Hydrophilic fatty ointments.
 - 4.4. O/W creams
 - 4.5. W/O creams
 - 4.6. Pastes.
5. Quality control of dermal preparations.
6. Study of the most important dermal preparations.

II. Suppositories and vaginal ovals:

1. Mechanism of action and drug release of suppositories.
2. Suppositories excipients.
3. Suppositories preparation.
4. Suppositories quality control.
5. Vaginal ovals.

III. Sustained-release and controlled release semisolid pharmaceutical dosage forms:

Controlled release techniques- controlled release processes.

Lab Section Topics:

1. Gels.
2. Hydrophobic ointments.
3. Hydrophilic ointments.

4. O/W creams.
5. W/O creams.
6. Antipyretic and analgesic suppositories.
7. Respiratory tract antiseptic suppositories.
8. Anti-hemorrhoids Suppositories.
9. Vaginal ovals (ichthyol).

G. Microbiological pharmacy Course (fourth year-first semester):

Class Section Topics:

Introduction to microbiological pharmacy:

1. Epidemiology of bacteria in pharmaceutical industry: Air, water, skin, raw materials, containers, buildings, equipment, cleaning tools.
2. Preservatives and bacteria damaging pharmaceutical products:
 - 2.1. Causing factors, damage types, and preservatives (uses, types, factors affecting them).
 - 2.2. Quality assurance and bacterial risks control.
3. Contamination of nonsterile pharmaceutical products: causing factors, sources, spread, control and contamination prevention.
4. Principles and methods of sterilization: organisms' sensitivity and mechanism of sterilization, sterilization methods (heat, gas, radiation, filtration).
5. Sterilization of pharmaceutical products:
 - 5.1. Injectable products: intravenous infusion, aqueous and oily liquids to be injected in small amounts.
 - 5.2. Sterile non-injectable fluids: water, dialysis fluids, aerosols.
 - 5.3. Ophthalmic preparations: eye drops, collyrium, ointments, liquids for contact lenses, cleaning liquids.
 - 5.4. Bandages and transplantation materials, and sutures.
 - 5.5. Absorbent materials/ cellulose oxides, foamed gelatin...etc

6. work safety in pharmaceutical factories and GMP:
 - 6.1. Quality assurance, GMP, quality control, in process control and bacterial contamination control (sterility of surrounding environment, raw materials, factory design and work methods, wrapping, storing and transporting).
 - 6.2. industry of sterile materials: sterile zone and its requirements, work in it, inner faces and joints between equipment, service, air supply, employees in the zone and their clothes, cleaning and sterilization, quarantine and before selling.
7. Sterilization assurance and control: surrounding environment control, sterilization control and sterility tests, sampling and specific situations.
8. Use of bacteria in pharmaceutical industry control:
 - 8.1. Pharmaceutical production: dextran, vitamins, amino acids...etc.
 - 8.2. Production and activity measurement of antibiotics.
 - 8.3. Use of antibiotics in pharmaceutical tests.
9. Antibacterials:
 - 9.1. Antibiotics: production, synthesis, mechanism of action and bacterial resistance.
 - 9.2. Antiseptics and sterilizing materials: types and production.
 - 9.3. Vaccines: production, control and manufacturing.

Lab Section Topics:

1. Sterilization by chemicals and tests of their activity and sterilization ability.
2. Sterilization by wet heat: autoclave, sterilization process, validation of sterilization process.
3. Sterilization by dry heat: control, test of relationship between temperature and time and its effect on sterilization process.
4. Sterilization by filtration: filtration of liquids and solutions, air filtration, control.
5. Validity tests of intact filters.
6. sterilization by gas and radiation and its control.

7. Preparation of bacterial media and important tools used in bacterial control testof: raw materials, tools, manufacturing process, pharmaceutical dosage forms...etc.
8. Sterilization test of tools used in pharmaceutical dosage form preparation (equipment, assistant tools, containers...etc).
9. Sterilization test and sterilizing some raw materials of pharmaceutical dosage forms.
10. Sterilization test of surrounding place of pharmaceutical dosage form preparation (sterilized atmosphere, clean atmosphere...etc).
11. Sterilization test of some sterile pharmaceutical dosage forms (ampules, powders for injection, serums, eye drops...etc).
12. Preservatives activity measurement of some pharmaceutical dosage forms containing them.
13. Measuring the bacterial content of some pharmaceutical dosage forms that are allowed to contain bacteria.

H. Community Pharmacy Course (fourth year-first semester):

Introduction to community pharmacy science.

1. Social classes and local health culture:
 - 1.1. Pharmacist role in health awareness.
 - 1.2. Pharmacist role in promotion of brochures and medical books.
 - 1.3. Pharmacist role in using the medical equipments.
2. Pharmacist role in society:
 - 2.1. Pharmacist in the city.
 - 2.2. Pharmacist in the country side.
 - 2.3. Pharmacist and primary health care.
 - 2.4. Pharmacist role in chronic diseases care (renal deficiency, diabetes, asthma...).
3. Pharmacist and endemic diseases
 - 3.1. Endemic diseases.
 - 3.2. Pharmacist role in the eradication of the endemic diseases.

4. Pharmacist and epidemiology:
 - 4.1. Epidemiology.
 - 4.2. Pharmacist role in the eradication of epidemiology.
5. Pharmacist and public health:
 - 5.1. Pharmacist and alcoholics.
 - 5.2. Pharmacist and drug abusers.
 - 5.3. Pharmacist and sexual diseases.
 - 5.4. Pharmacist and progeny restriction.
 - 5.5. Pharmacist and genetic diseases.
 - 5.6. Pharmacist and caring of cripple and disabled.
6. Pharmacist and drug consumption guiding:
 - 6.1. Herbal and chemical drugs.
 - 6.2. Antibiotics.
 - 6.3. Hormones.
 - 6.4. Measures of treatment costs calculation.
7. Pharmacist and laboratory signs and diets.
8. Pharmacist and health local and international organizations.

I. Industrial Pharmacy and Good Manufacturing Course (fourth year-second semester):

Class Section Topics:

1. Study of good manufacturing practice (GMP) in different manufacture stages.
2. Different departments of industrial institutions: search department, production departments, control departments, quarantine and storing departments, administrative departments, attached departments.
3. Industrial processes:
Premanufacturing processes: air process, sterile rooms, water process and types of water.

4. Primary pharmaceutical processes:
 - a. Automated processes:
 1. Solids division: milling and millers.
 2. Solids separation: sieving and sieves.
 3. Solids mixing: industrial mixers.
 4. Separation and mixing of liquids: squeezing, clarifying, filtration, centrifugation, blenders and industrial mixers.
 - b. Pharmaceutical and physiochemical processes:
 1. Thermal processes: heating, refrigerating and condensation, evaporation, distillation, drying and sterilization.
 2. Solubilization and auxiliary materials used in solubility improvement.
 - Use of cosolvents, use of surfactants.
 - Formation of combined complexes (cyclodextrins derivatives).
 - Formation of soluble salts.
 - c. Wrapping processes: packaging and wrapping industrial equipment.
5. Study of factors affecting formulation:
 - 5.1. Physiochemical properties.
 - 5.2. Solubility of medicinal materials.
 - 5.3. Crystal polymorphism.
 - 5.4. Compressibility of medicinal materials and granules.
 - 5.5. Studying stesiometry of medicinal materials.
6. Stability of active ingredient.
7. Interactions between excipients and active ingredient.

Lab Section Topics:

1. Preparing tablets by wet granulation.
2. Preparing tablets by direct compression.
3. Preparing sugar coated tablets.
4. Preparing enteric coated tablets.

5. Preparing sustained release (SR) tablets.
6. Preparing effervescent tablets containing vitamin C and calcium.
7. Preparing anti-hemorrhoids suppositories.
8. Preparing injectable aqueous solution of sodium diclofenac.
9. Preparing eye and ear drop of gentamicin sulfate.
10. Preparing nasal drop of phenylephrine hydrochloride.
11. Preparing oily injectable solution of progesterone.
12. Preparing medical antifungal shampoo.
13. Preparing cosmetic shampoo.
14. Preparing dental paste.
15. Preparing nail paint.
16. Preparing cosmetic O/W cream with vitamins A&E.
17. Preparing lip sticks.
18. Preparing W/O sunblock cream (UV A+B).
19. Preparing swim oil with sunblock.
20. Preparing hair gel.
21. Preparing antiseptic lotion containing benzoyl peroxide.

J. Biopharmacy and Pharmacokinetics Course (fourth year-second semester):

Class Section Topics:

1. Factors affecting drug activity: biopharmacy phase, pharmacokinetic phase, pharmacodynamic phase.
2. Medicinal materials: physical and chemical properties, solubility, distribution coefficient and pKa, stability, drug classification, drug dosing, factors affecting drug dose.
3. Pharmaceutical dosage form design: good manufacturing practice, medicinal components, general considerations in drug formulation, preformulation study, preparation stability and stability tests, protection of bacterial contamination, appearance, taste, and containers.

4. Factors affecting pharmacokinetics and drug release according to first order
 - 4.1. Preparations for injection.
 - 4.2. Oral preparations:
 - I. Preparations taken by mouth.
 - II. Buccal preparations.
 - III. Physiological and pathogenic factors affecting oral absorption .
 - 4.3. Anal Preparations, inhalators, dermal preparations, ophthalmic preparations.
 - 4.4. Nasal preparations, otic preparations, vaginal preparations.
5. Bioavailability and bioequivalence:
 - Concept of bioavailability, total bioavailability, relative bioavailability, order of reaction or transformation.
 - Drugs half- time (biological half-life).
 - Calculating residual percentage of intravenous dose.
 - 5.1. Zero-order, first order:
 - Bioavailability and bioequivalence tests.
 - Dosage forms.
 - Time- Blood Concentration curves.
 - 5.2. Evaluation criteria of bioavailability- methods of studying bioavailability.
 - Bioequivalence test, evaluation of bioequivalence results.
 - 5.3. Pharmacokinetics models:
 - Pharmacokinetics Linear model - multicompartment model.
6. Drug delivery systems:
 - 6.1. Concept and definition.
 - 6.2. Drug release according to zero order.
 - 6.3. Components of drug delivery system.
 - 6.4. The most important energy sources in drug delivery systems.

6.5. Systemic drug delivery systems: infusion systems, epidermal systems, oral systems, rectal systems.

6.6. Topical drug delivery systems:

- a. Ophthalmic systems, intrauterine systems, implant pumps provided by osmotic ability.
- b. Closed-control drug delivery systems.

6.7. Transporters.

Lab Section Topics:

1. Studying the drug release from tablets prepared with binders (povidone or starch gel).
2. Studying the drug release from tablets prepared with lubricants (lubricant type and mixing time).
3. Studying the drug release from tablets and capsules.
4. Studying the drug release from suppositories prepared by aqueous or fatty excipient.
5. Studying the drug release from sublingual tablets.
6. Studying the drug release from dermal preparations.
7. Studying the accelerated drug degradation by using temperature and humidity.
8. Studying the accelerated drug degradation in liquid forms.
9. Planning of bioequivalence study.
10. Problems in pharmacokinetics.
11. Studying the drug release by using artificial membranes.
12. Studying the drug release by using animal intestines.

K. Clinical Pharmacy and Hospital Pharmacy Course (Fifth year-firstsemester):

Class Section Topics:

1. Introduction:
 - 1.1. Definition.
 - 1.2. Aim of study.
 - 1.3. International progression.
 - 1.4. Application requirements.
 - 1.5. The role of clinical pharmacist.
2. Pharmacokinetics:
 - 2.1. Application in treatment monitoring.
 - 2.2. Basic concepts.
 - 2.3. Clinical applications.
3. Drug interactions:
 - 3.1. Definition and mechanisms.
 - 3.2. Mechanisms related to pharmacokinetics.
 - 3.3. Mechanisms related to drug action.
 - 3.4. Clinical cases.
4. Adverse effects:
 - 4.1. Definition and classification.
 - 4.2. Predisposing factors: multiple medications, age, sex and pathological state.
 - 4.3. Type and mechanism of adverse effects.
 - 4.4. Adverse effects detection.
 - 4.5. Drug adverse effects on : liver, skin and lungs
5. Study of laboratory data: biochemical and homological changes.
6. Nutrition with injection solutions.
7. Treatment costs.

8. Drugs and patient age: newborn, children and elderly.
9. Drugs in pregnancy and breastfeeding.
10. General strategy of treatment:
 - 10.1. Disease nature: definition, causes, pathogenicity, prevalence.
 - 10.2. Medical history: patient details, family and social history .
 - 10.3. Drug selection.

Lab Section Topics:

- I. Discussion of clinical problems related to:
 1. Gout.
 2. Migraine.
 3. Congestive heart failure.
 4. Asthma.
 5. Meningitis, respiratory drug infections, viral hepatitis.
 6. Enterocytes infection.
 7. Alcoholism.
 8. CO poisoning.
 9. Diabetes.
 10. Hyperlipidemia.
 11. Diets.
 12. Psychologic drugs.
- II. Problems in clinical pharmacokinetics:
 1. Oral administration (single dose): calculation of AUC, K, $t_{1/2}$ and MRT.
 2. Intravenous administration of drug.
 3. Intravenous infusion of drug.
 4. Administration of frequent drug doses (oral, intravenous).

Details of Pharmacology and Toxicology Department Courses

A. Physiology and Anatomy Course (first year, second semester):

Class Section Topics:

- First chapter: Physiology:
 1. Neurophysiology.
 2. Endocrine physiology.
 3. Digestive physiology.
 4. Blood physiology.
 5. Cardiovascular physiology.
 6. Renal physiology.
 7. Respiratory physiology.
- Second chapter: Anatomy:
 1. Definitions:
 - 1.1. Basic definitions.
 - 1.2. Basic terminology used in anatomy.
 - 1.3. The basic components of human body.
 - A. Skin B. fasciae C. cartilages D. bones E. joints
 - F. muscles G. serous membranes I. nervous tissue
 - H. blood vessels
 2. The Locomotor system:
 - 2.1. Skeleton:
 - A. Head bones B. The vertebral column C. Thoracic cage
 - D. Scapular girdle E. Pelvic girdle F. The limbs bones.
 - 2.2. Body muscles:
 - A. Pectoral muscles B. Limb muscles C. Pharyngeal muscles
 - D. Throat muscles E. Facial and head muscles

F. Perineal muscles.

3. The nervous system:

3.1. The central nervous system:

- A. Meninges
- B. The brain: the cerebrum, the cerebellum, the brainstem,
- C. The spinal cord
- D. Arterial feeding of the CNS.

3.2. The peripheral nervous system:

- A. The cranial nerves,
- B. The spinal nerves.

3.3. The autonomic nervous system:

- A. Sympathetic nervous system,
- B. Para sympathetic nervous system.

4. The cardio vascular system:

4.1. The heart:

- A. External description,
- B. Internal description,
- C. Heart blood vessels,
- D. The nerve supply.

4.2. The circulatory system:

- A. The arteries: aorta, pulmonary artery.
- B. B. The veins: the superior vena cava, the inferior vena cava, the portal vein, the pulmonary veins.
- C. C. The lymphatic system: Lymphatic vessels, lymphatic nodes, the spleen.

5. The respiratory system:

5.1. Upper respiratory tracts:

- A. The nose,
- B. the nasal pharynx,
- C. the larynx.

5.2. Lower respiratory tracts:

- A. The trachea,
- B. the bronchi,
- C. the lungs.

5.3. The pleura.

5.4. Mediastinum.

5.5. The diaphragm.

6. The digestive system:

6.1. The mouth.

- 6.2. The oral part of pharynx.
- 6.3. The laryngeal pharynx.
- 6.4. The oesophagus.
- 6.5. The stomach.
- 6.6. The intestines.
 - A. The small intestine: the duodenum, jejunum and ileum.
 - B. The large intestine: cecum, ascending colon, transverse colon, descending colon, the rectum.
- 6.7. The digestive accessory organs.
 - A. The liver, B. the pancreas.
- 6.8. The peritoneum.
7. The Genitourinary system:
 - 7.1. Urinary parts:
 - A. The kidneys, B. the ureters, C. the urinary bladder, D. the urethra.
 - 7.2. Genital parts:
 - A. Genital parts in men: the prostate, the seminal vesicles, vas deferens canals, testicular, the penis.
 - B. Genital parts in women: the uterus, the tuba uterine, the ovaries, the vagina, the vulva.
8. The Endocrine system:
 - 8.1. Pituitary gland.
 - 8.2. Pineal gland.
 - 8.3. The thyroid gland.
 - 8.4. The parathyroid glands.
 - 8.5. Adrenal glands.
 - 8.6. The breast gland.
 - 8.7. The salivary gland.
 - A. The parotid gland B. submandibular glandC. sublingual gland.
9. The organs of audio visual sensation:

9.1. The ear:

A. The external ear, B. the middle ear, C. the internal ear.

9.2. The eye:

A. The coats of the eye, B. the lacrimal system.

B. Toxicology(1) Course (third year- first semester):

Class Section Topics:

1. General introduction.
2. The entrance routes of toxic compounds into the body.
3. The metabolism and pharmacokinetics of toxic compound (absorption, distribution, metabolism, and excretion).
4. Classification of poisons.
5. Gaseous poisons.
6. Volatile poisons.
7. Poisons isolated by steam distillation, and organic poisons.
8. Metallic poisons (briefly).
9. Corrosive substances.

Lab Section Topics:

1. Introduction.
2. Basics in toxicological analysis.
3. Volatile poisons.
4. Poisons isolated by steam distillation.
5. Metallic poisons.
6. Organic poisons.

C. Pharmacology(1)Course (third year- second semester):

- First chapter:
 1. Main principles of pharmacology.
 2. Local hormones.
 3. Muscle relaxants.
 4. General anesthetics.
- Second chapter:
 1. Autonomic nervous system drugs.
 2. Central nervous system drugs:
 - 2.1. Central nervous system agonists.
 - 2.2. Central nervous system antagonists.
 3. Drugs affecting the motor functions:
 - 3.1. Antiepileptic drugs.
 - 3.2. Anti-Parkinson drugs.
 4. Endocrine glands hormones:
 - 4.1. Pituitary gland.
 - 4.2. Thyroid gland.
 - 4.3. Pancreas gland.
 - 4.4. Adrenal gland.

D. Pharmacology (2) Course (fourth year- first semester):

Class Section Topics:

- First chapter:
 1. Anti-hyperlipidemia drugs.
 2. Thrombosis: pathological physiology and prevention.
 3. Urinary system drugs.
 4. Dermal drugs.

5. Anti-inflammatory drugs.
 6. Cancer chemotherapy.
- Second chapter:
 1. The circulation system.
 2. The cardio-vascular system.
 3. Antiarrhythmic drugs.
 4. Anti-angina drug.
 5. Anti-hypertension drugs.
 6. The immune system and immunological drugs.
 - Third chapter:
 1. The respiratory system.
 2. Respiratory system drugs.
 3. The digestive system.
 4. The digestive system drugs.
 5. Anti-bacterial drugs.
 6. Vitamins.

Lab Section Topics:

1. Introduction about experiments on animals: aims and types.
2. Materials and physiological solutions used in experiments.
3. Drugs bio-assays.
4. Determination of drug toxicity.
5. Investigation of drug activity.
6. Investigation of sympathomimetic drugs activity.
7. Investigation of para sympathomimetic drug activity.
8. Muscarine receptors antagonists.
9. Neuromuscular blocking agents.
10. Local hormones.

11. Cardiac glycosides.
12. Antiarrhythmic drugs.
13. Antihypertensive drugs.
14. Analgesics.
15. Anti-epileptic drugs.
16. Anti-inflammatory drugs.

E. Toxicology (2) Course (fourth year- first semester):

1. Sources of poisoning.
2. Selective localization of poisons.
3. Effect of toxic substances on the body.
 - 3.1. Effect in tissues and organs.
 - 3.2. Effect on the molecular level.
4. Basics of management and treatment.
5. Poisoning in children.
6. Pesticides.
7. Botanical toxins.
8. Zoological toxins.
9. Household chemicals.

F. Public Health and Environment Pollution Course (fourth year- second semester):

1. Air pollution:
 - 1.1. Pandemics and public health.
 - 1.2. Pollution: types, sources, pollutant classification.
 - 1.3. Air pollution and effects caused by different pollutants.

- 1.4. Waste treatment and effects caused by different pollutants.
- 1.5. Factors affecting pollutant distribution;
 - a. In inside surroundings.
 - b. in outside surroundings.
- 1.6. Environmental pollutant effects on body organs and systems, and possibility of genetic transfer.
- 1.7. Environmental risks analysis.
2. Water, air and soil pollution:
 - 2.1. Introduction and general definitions.
 - 2.2. Chemical pollution and its toxic effects;
 - a. Heavy metals.
 - b. cleaners and phosphates.
 - c. Petrol and hydrocarbons.
 - d. Pesticides and fertilizers.
 - 2.3. Radioactive material pollution and its toxic effects.
 - 2.4. Thermal pollution.
 - 2.5. Biological pollution;
 - a. Bacteria, viruses, and parasites pollution.
 - b. Drink water disinfection.
 - 2.6. Water standard tables.
 - 2.7. Acidic rain and its effects on water and soil.
 - 2.8. Plastic compounds: environmental effects and toxicity.
 - 2.9. Environmental pollution and genetic effects: control of toxic materials in environment.

G. Applied and Forensic Toxicology Course (fifth year- second semester):

Class Section Topics:

1. Forensic importance of misused drugs:
 - 1.1. Forensic importance of benzodiazepines.
 - 1.2. Forensic importance of barbiturates.
 - 1.3. Forensic importance of opioids.
 - 1.4. Forensic importance of cannabis.
 - 1.5. Forensic importance of hallucinogens.
2. Forensic importance of drugs affecting behavior.
3. Forensic importance of paracetamol,
Forensic importance of sodium and potassium ions.
4. Drug interaction seriousness: death, criminal toxicity, accidental toxicity.
5. Vocational Poisons.
6. Clinical poisons.

Lab Section Topics:

1. Cannabis detection.
2. Some metals assays.
3. Chromatography.
4. General assays.

H. Molecular Pharmacology Course (fifth year- second semester):

1. Biological systems: definitions and terms, dose-response curves.
2. Molecular types of drug-receptor interactions.
3. Stimulant-response mechanism.
4. Drug concentrations in tissues.

5. Signal strength.
6. Stability and transition.
7. Variations statistical correction.
8. Pharmacologic classification and null hypothesis.
9. Molecular interaction of numerical variations.
10. Specific methods of drug features measurement- functional studies- correlation studies.
11. Drug-receptor pharmacokinetic measurement.
12. Genetic engineering of biologic test systems.

<p style="text-align: center;">Details of Analytical and Food Chemistry Department Courses</p>

A. Physical Chemistry Course (second year-first semester):

Class Section Topics:

1. Atomic and molecular structure:
 - 1.1. Main molecules.
 - 1.2. Atomic structure.
 - 1.3. Atoms binding forces.
 - 1.4. Molecules binding forces.
2. States of matter:
 - 2.1. The gaseous state.
 - 2.2. The liquid state.
 - 2.3. The solid state.
3. The use of physical properties in studying medicinal molecules:
 - 3.1. Determination of density, determination of melting and boiling points, determination of surface tension, determination of viscosity.

- 3.2. Spectral properties: electromagnetic radiation, atomic and molecular spectra, ultraviolet and visible spectra, phosphorylation and fluorescence, dielectric constant and induced polarization (IP), permanent dipole resolution and infrared spectroscopy, nuclear magnetic resonance (NMR) spectroscopy and electron spin.
- 3.3. Refractive index and molecular refraction.
- 3.4. Optical rotation: polarization, optically active materials, optical activity measurement, optic rotation dispersion (ORD), circular dichroism (CD).
- 3.5. Mass spectrometer (MS).
- 3.6. Electrophoresis.
4. Structure-activity relationship:
 - 4.1. Factors that determine activity.
 - 4.2. Examples of structure-activity relationship.
 - 4.3. Active and inactive collisions.
 - 4.4. Inevitability and probability.
5. Thermodynamics and equilibrium:
 - 5.1. Principles of thermodynamics, entropy, and enthalpy.
 - 5.2. Thermodynamic equilibrium.
6. Chemical kinetics:
 - 6.1. Reaction ratio and orders.
 - 6.2. Effect of temperature and other factors on reaction ratio.
 - 6.3. Stability and decomposition, and accelerated stability study
7. Chemical reactions in electrochemical cells:
 - 7.1. Electrochemical cells.
 - 7.2. pH electrical determination.
 - 7.3. Specific ions and redox reactions.
 - 7.4. Potention.
8. Diffusion and dissolution:
 - 8.1. Diffusion: methods and instruments.

- 8.2. Dissolution, drug release.
- 8.3. Diffusion principles in biological systems.
- 8.4. Thermodynamics of diffusion.
9. Interfacial phenomena:
 - 9.1. Interfacial fluid.
 - 9.2. Adsorption at the liquid/ solid interface.
 - 9.3. Electrical properties.
10. Liquid rheology:
 - 10.1. Newtonian and non-Newtonian systems.
 - 10.2. Thixotropy.
 - 10.3. Viscosity and plasticity.
 - 10.4. Applications in pharmacy
11. Colloids:
 - 11.1. Colloidal systems.
 - 11.2. Optical properties.
 - 11.3. Kinetic properties.
 - 11.4. Electrical properties.
 - 11.5. Solubility.
12. Nanoparticles and coarse suspension:
 - 12.1. Particle size, particle distribution, particle size measurement, powder properties.
 - 12.2. Suspension and its formation.
 - 12.3. Emulsions, physical stability, facial equilibrium and emulsion formation.

Lab Section Topics:

1. Determination of fluid and solid density:
 - 1.1. Determination of fluid density.
 - 1.2. Determination of solid density.

2. Polarization and refractive index.
3. Surface tension:
 - 3.1. Surface tension measurements of pure fluids and mixtures.
 - 3.2. Surface tension measurements of surfactant solutions.
4. Fluid viscosity.
5. Spectrometer, colorimetric determination of iron.
6. Thermal analysis: differential thermal analysis (DTA) and thermal gravimetric analysis (TGA).
7. Chemical reaction rate (I):
 - 7.1. Concentration effect on reaction rate.
8. Chemical reaction rate (2):
 - 8.1. Determination of rate and order of H_2O_2 decomposition reaction.
9. Ethyl acetate hydrolysis.
10. Determination the kinetics of sucrose inversion reaction using polarimetry.
11. Electrochemical cells.
12. Potential determination of an ionization constant of a weak acid.
13. Determination of dissociation constant of a weak conductor electrolyte.
14. Determination the enthalpy of neutralization reaction using calorimeter.
15. Determination of solubility constant of poorly soluble salts.
16. Colloidal solutions.
17. Electrical properties of colloidal systems, stability and coagulation of colloidal systems.
18. Emulsions, foams.
19. Formation of lyophilic dispersed systems, determination of critical concentration of micelle formation.

B. Analytical Chemistry (1) Course (second year- first semester):

Class Section Topics:

1. Solutions:
 - 1.1. The concepts of solute, solvent, and solution and mechanism of dissolution.
 - 1.2. Solution concentration and its expression methods.
2. Basic principles of chemical equilibrium, reaction rate, equilibrium types, equilibrium constant, Le Châtelier's principle, activity and factors affecting activity.
3. Poorly soluble compounds and solubility product constant (KSP): calculations of solubility and solubility product constant, activity product, factors affecting solubility of precipitates, common-ion effect, different-ion effect, separated precipitation.
4. Principles and calculations of volumetric analysis.
5. Acid-base assay: pH concept and calculation, buffer solutions, assay curves, indicators, and applications.
6. Non-aqueous assays: principles, solvents, and applications.
7. Precipitation assays: methods and applications.
8. Complexometric assays (chelation): co-binding compounds, mercury meter, complexone meter, assay curves, indicators, and applications.
9. Reduction-oxidation (redox) reactions: concept of oxidation-reduction reactions, potentiometric measurements, potassium permanganate meter, potassium dichromate and cerium meter, iodine meter, bromide-bromate meter, other examples of volumetric method and applications.
10. Principles and calculations of gravimetry.
11. Processes of gravimetry.
12. Gravimetry methods: volatilization, precipitation, co-precipitation and post precipitation, electrical precipitation, and applications.
13. Organic precipitants and their applications.

Lab Section Topics:

1. Experiments of acid-base assays:
 - 1.1. An application of different indicators and their changes according to different pH.
 - 1.2. Titration of strong acids using strong bases.
 - 1.3. Titration of weak acids.
 - 1.4. Titration of strong and weak bases with acids.
 - 1.5. Titration of salt solutions.
 - 1.6. Preparation of specific concentrations of acid and base solutions.
 - 1.7. Preparation of buffer solutions.
2. Silver meter experiments:
 - 2.1. Titration of Sodium Chloride (NaCl) by Mohr's method.
 - 2.2. Titration of Sodium Chloride (NaCl) by Volhard Charpenier's Method.
 - 2.3. Titration of Potassium Iodide by Fajan's Method.
 - 2.4. Titration of Potassium Cyanide by Liping-Deng's method.
 - 2.5. Barbituric acid derivatives.
 - 2.6. Mixture of two halogens indirectly.
3. Redox reactions experiments:
 - 3.1. Potassium permanganate meter experiments.
 - 3.2. Experiments of oxidation by chloride and hypochloride.
 - 3.3. Iodine meter experiments.
 - 3.4. Experiments of oxidation by iodates.
 - 3.5. Bromide meter experiments.
 - 3.6. Potassium dichromate meter experiments.
 - 3.7. Ammonium ceric sulphate meter experiments.
4. Complexometric Titrations (chelometry) experiments:
 - 4.1. Indicators and blocking agents.
 - 4.2. Titration of a mixture of calcium and magnesium.

5. Weight Analysis Experiment:

- 5.1. Determination of crystal hydrates in crystallized barium chloride.
- 5.2. Titration of barium in salts of its volatile acid.
- 5.3. Titration of iron as ferric oxide.
- 5.4. Titration of sulphate as barium sulphate.
- 5.5. Titration of chloride as silver chloride.

C. Analytical Chemistry (2) Course (second year, second semester):

Class Section Topics:

1. methods of extraction:

1.1. Extraction by solvents:

- a. Two immiscible solvents: Simple extraction, frequent extraction, extraction based on formation of metal-organic complexes, and extraction based on ions pairs formation.
- b. Two miscible solvents: osmosis and dialysis.

1.2. Extraction using solid phase:

- a. Adsorption: principles and distribution.
- b. Extraction using ion exchange: principles and theoretical study.

2. Chromatography methods:

- 2.1. Adsorption: columns, high performance liquid chromatography (HPLC), thin layer adsorption (TLC).
- 2.2. Liquid- liquid distribution: columns, papers, and thin layer (cellulose).
- 2.3. Liquid-gas distribution, solid-gas distribution: gas chromatography.

3. Electrophoresis :

- 3.1. Frontierelectrophoresis (fluid phase).
- 3.2. Zone electrophoresis (supporting medium electrophoresis).
- 3.3. Factors affecting separation according to the basic theory and the comprehensive theory
- 3.4. Capillary electrophoresis.

4. Gel Filtration.
5. Ultracentrifugation separation.

Lab Section Topics:

1. Extraction applications using two immiscible solvents and evaluation of the yield.
2. Extraction applications using two miscible solvents.
3. Extraction applications based on formation of organic-metal complexes.
4. Extraction applications based on formation of ion pairs.
5. Applications of gel Filtration.
6. Applications of paper chromatography.
7. Applications of thin layer chromatography.
8. Extraction by ion exchange.
9. Separation of organic compounds or metal ion mixtures using ion exchange.
10. Separation of organic mixtures using column by adsorption controlled by polarity of the mobile phase (preparation and study of mobile phases).
11. Separation of organic mixtures on column using liquid-liquid distribution (preparation and assessment of mobile phases).
12. Preparation of columns and calculation of theoretical layers number.
13. Preparation of thin layers and studying factors that influence compound separation.
14. The effect of phase acidity on some analytical processes.

D. Instrumental Analysis and its Applications Course (forth year- first semester):

Class Section Topics:

1. Optical methods:
 - 1.1. Absorption:

- a. Molecular optical absorption: visible spectroscopy (colorimetry and spectrophotometry), ultraviolet spectroscopy and infrared spectroscopy.
 - b. Atomic absorption: atomic absorption spectrophotometry.
- 1.2. Emission:
- a. Molecular emission: fluorescence and fluorometry.
 - b. Atomic emission: flamephotometry.
2. Kinetic methods of analysis:
- Intermediation, enzymatic Intermediation, fixed enzymes, applications.
3. Mass spectrometry and gas chromatography.
4. The devices that depend on nuclear magnetic resonance (NMR) and their applications.
5. The devices that depend on electrochemical technique:
- 5.1. Potentiometry.
 - 5.2. Amperometry.
 - 5.3. Polarography.
 - 5.4. Direct and indirect coulometry.
 - 5.5. Conductometry.

Lab Section Topics

1. Applications of spectroscopy methods.
2. Practical concept of complementary color.
3. The determination of the maximum absorption wavelength, absorption curve and the solution concentration.
4. Extinction coefficient.
5. Absorption in ultraviolet.
6. Assays in visible.
7. Assays in the ultraviolet.

8. Organic mixtures assay.
9. Applications of fluorometry.
10. Applications of flame spectrophotometry.
11. Applications of atomic spectroscopy.
12. The use of pH meter in acid-base assays.
13. Applications of Conductometry.
14. Applications of infrared spectrophotometry.
15. Spectral study of chemical kinetics in drug analysis.
16. Applications of electrophoresis.
17. Applications of high performance liquid chromatography (HPLC).
18. Applications of gas chromatography (GC).
19. Applications of electrochemistry, Galvanic cells and electrochemical indicators.
20. Applications of potentiometry.
21. Applications of coulometry.
22. Applications of Amperometry.
23. Applications of polarography.

E. Nutrition and Diets Course (fifth year- first semester):

1. Nutrition:
 - 1.1. The importance of nutrition.
 - 1.2. The basics of human healthy nutrition and energetic requirements.
 - 1.3. Nutrient elements: existence, role and need.
 - 1.4. The nutrition of the normal (healthy) elderly.
 - 1.5. The nutrition of the children.
 - 1.6. The nutrition of the teenagers.
 - 1.7. The nutrition of the pregnant and breastfeeding.
 - 1.8. The nutrition of the old people.

1.9. Parenteral solutions (nutrition solutions).

1.10. Diseases related to nutrition.

2. Diets:

2.1. High-energy diet.

2.2. Low-energy diet.

2.3. The diabetic diet.

2.4. The renal stones diet and the high uric acid diet.

2.5. Low-protein diet.

2.6. Cardiovascular diseases diet.

2.7. Respiratory failure diet.

2.8. The diets of esophagus diseases, peptic ulcers and intestinal diseases.

2.9. The diets of hepatic and bile tracts diseases.

2.10. Pancreatic insufficiency diet.

2.11. Anemia diet.

2.12. Surgical operations diets.

F. Food Chemistry and Control Course (fifth year- second semester):

Class Section Topics:

1. Introduction about food importance and the study of food chemistry.

2. Water found in food:

structure, the content of water in different kinds of food, physical and chemical properties, water activity concept, the effect of food composition and physical state on water fixing, the effect of water activity on food devastating reactions and water assays methods.

3. Minerals:

3.1. Abundant elements: sodium, potassium and calcium.

3.2. Trace elements (phosphorus, ferrous, copper, zinc, molybdenum, cobalt, aluminum, iodine, Fluor, selenium) and toxic elements (arsenic, lead, mercury, cadmium, nickel....) and assay methods.

4. Vitamins:

4.1. Water-soluble vitamins.

4.2. Fat-soluble vitamins: food rich with them, factors leading to lose them, food-vitamin defect repair and assay methods.

5. Proteins:

- Amino acids, peptides, proteins
- Physical and chemical properties, chemical reactions in different conditions of amino acids, proteins quality control tests and assay methods.

6. Carbohydrates:

6.1. Monosaccharides: structure, classification, physical and chemical properties, reactions and assay methods.

6.2. Rare carbohydrates: structure, physical and chemical properties and assay methods.

6.3. Polysaccharides: composition, properties, types (fibers, starch, cellulose, Mucilage, gums, alginates, pectin, amylopectin, amylose....) and assay methods.

7. Enzymes:

Sources, types, benefits, enzymatic reactions mechanism, role in food and factors affecting their function.

8. Fats:

8.1. Fatty acids: structure, classification, nomenclature, physical and chemical properties, basic reactions and assay methods.

8.2. Triglycerides: nomenclature, classification and physical and chemical properties.

8.3. Phospholipids: general structure and important types.

8.4. The components of unsaponified fat:

- a. Most important components: hydrocarbons, sterols, vitamins.
- b. Fat quality control tests, fat quantitative determination methods and state changing tests in different conditions.

9. Fat oxidation:

Definition of oxidation, oxidation reactions mechanism, affecting factors, formation of the secondary oxidation products, oxidations stopping reactions and their products, the effect of oxidation on food quality and oxidation stage evaluation tests.

10. Antioxidants:

Natural antioxidants, chemical antioxidants, secondary effect antioxidants, technical processes that stop oxidation, antioxidants extraction and assay methods.

11. Preservatives:

Importance, classification, types, physical and chemical properties, their functional perfect conditions, enzymatic and bacterial methods to detect preservatives, physical and chemical methods to detect and assay preservatives, materials used in cleaning and antisepsis and their detection methods.

12. Nitrate, nitrite and nitrosamine:

12.1. Nitrate and nitrite: source, industrial usage, toxicology and physiological role, their usage legislations and assay methods.

12.2. Nitrosamine: structure, classification, accumulation conditions in food, toxicology, detection and assay methods.

13. Coloring agents:

Classification, types, nutritional conditions, interaction between the coloring agent and food or container, toxicology, detection and assay methods, their usage legislations.

14. Sweeteners:

Classification (carbohydrates, alcoholic carbohydrates, natural sweeteners, chemical sweeteners), uses, stability in different conditions and assay methods.

15. Texturizer:

Emulsifiers, gelatin and thickeners.

16. pH modifiers:

Inorganic acids, organic acids, bases, importance and usage, assay methods.

17. flavors:

Classification, types, physical and chemical properties of flavoring molecules, the relationship between food chemical composition and flavor, general methods of assay.

18. Auxiliary substances used in food technology:

Purification materials, anti-foam agents, solvents, water processing materials, materials leading to bio-transformation in food, ion-exchangers, gases, conditioners, flour whiteners and improvers.

19. Enzymatic activity:

The benefit of enzymatic activity detection, the use of enzymes in assays, the effect of enzymatic activity in the odor, flavor, color and ripeness of fruit and vegetables, enzymes undesirable effects, protection methods.

20. Non-enzymatic browning:

Definition, Materials needed for it, types (Maillard reaction, vitamin C devastation), formation stages, reactions mechanisms, products, factors affecting reactions, undesirable effects, and protection methods.

21. Food contamination:

21.1. Fungal and bacterial contamination.

21.2. Fungal toxins contamination.

21.3. Hydrocarbons contamination.

21.4. The contamination of insecticide residues.

21.5. Toxic metals contamination:

Contamination sources, the most important contaminating metals, their effect on food spoilage and consumer health.

22. Food poisoning:

Natural toxic food (mushrooms) and anti-nutrition materials (types, distribution and effects).

23. Food-drug interaction:

23.1. Food effects on drugs.

23.2. Drugs effects on food.

Undesirable effects on both food and drugs.

24. Food preservation principles:

Dehydration, refrigeration, freezing, canning and radiation.

25. Packaging and wrapping materials:

Types, needed conditions, advantages and disadvantages, possible interactions between food and these materials and some methods to test the validity of containers.

26. Milk and dairy products:

Milk: components, types and physical and chemical properties.

Dairy products: (curd, cream, butter, cheese....) components, properties, types, nutrient value, assay methods of the components and safety and quality evaluation.

27. Eggs:

Composition, specific proteins, nutrient value, quality control tests, age determination, eggs products and spoilage.

28. Meat:

The composition of muscular tissues, components, differential factors between different kinds of meat, and meat products.

29. Fats and oils:

Sources, types, compositions, technical procedures of obtaining, refining and purification, oils hardening, diagnostic-differential tests of oils and fats types, quality control and assay tests.

30. Cereals and their products:

Wheat, corn, rice, barley and their products, quality control tests.

31. Fruit and vegetables products:

Jams, compotes, fresh and preserved juices, components, condensed juice, canned vegetables, quality control and safety tests.

32. Honey:

Source, composition, types, factors affecting the quality, physical and chemical properties, methods of components assay and quality control.

33. Coffee, tea and cocoa:

Source, composition, types, quality signs and quality control tests.

Lab Section Topics:

1. Moisture calibration in food.
2. Ash calibration.
3. Carbohydrates calibration using different methods:
Cousse Bonnane, Bertrand, Luff Schoorl.
4. Proteins and gluten calibration.
5. Abundant and trace metals.
6. Fatty materials quality control:
 - 6.1. Rayshar- Maysel index and Bolenesk.
 - 6.2. Iodine index.
 - 6.3. Saponification index.
 - 6.4. Peroxide index.
 - 6.5. Chrise reaction.
 - 6.6. Acidity calibration.
 - 6.7. Fatty acid calibration in food.
 - 6.8. Cheating detection and quality determination of oils.
7. Acidity calibration in juices and canned food.
8. Antioxidants detection and calibration.
9. Preservatives detection and calibration.
10. Coloring agents detection and extraction.
11. pH modifiers detection and calibration.
12. Artificial sweeteners detection.
13. Calibration of nitrates and nitrites in food.
14. Calibration of vitamin C in food.
15. Water analysis: ions detection and water hardness.

16. Chromatography on paper.

17. Quality control tests of milk and its products.

18. Quality control tests of canned food.

18.1. Determination of alcohol percentage in canned food.

18.2. Basic nitrogen ABUT.

Details of Biochemistry and Microbiology Department Courses

A. Zoological Biology Course (first year-first semester):

Class Section Topics:

I. Biology of cell:

1. The structure and function of macro molecules: polymers, saccharides, lipids, proteins, nucleic acids.
2. Cellular organism: methods of studying cell, prokaryotic cells and eukaryotic cells, nucleus, ribosomes, inner membranous structures, peroxisomes, mitochondrion, cellular skeleton, cellular wall.
3. The structure and function of cellular membrane: micro molecules passage, macro molecules passage, elimination and endocytosis.
4. Cell division: introduction to chromosomes in eukaryotic cells, cellular cycle, mechanism of cell division, cell division control.

II. Genetics:

5. meiosis division and sexual cycle: genes, DNA and chromosomes, meiosis division, comparison between metosis division and meiosis, sexual base of genus diversion, genetic development and diversion
6. Molecular base of genetics:
 - DNA (the structure), DNA (replication), DNA (transcription).
 - RNA (transition), control of genetic expression in prokaryotic cells and eukaryotic cells.
 - Genetic mutation: types, mutating materials.
7. Viral and bacterial genetics:

Structure and genome, the difference between bacterial and viral genome, bacteriophage (bacterial viruses).
8. Cancer genes.

III. Growth biology:

9. Reproduction: sexual and asexual reproduction, reproduction in mammals.
10. Phylogeny and type development of sexual reproduction in vertebrates.
11. Growth and growing: growth, controlling growth and growing, structure formation, structure transformation, growing in vertebrates, incitement and nature of organizer, genes role in growing.

Lab Section Topics:

1. Study of some animal cell types:
 - 1.1. Neurons.
 - 1.2. Blood cells.
 - 1.3. Muscle cells.
 - 1.4. Cartilage cells.
2. Study of some active cytoplasmic inclusions:
 - 2.1. Mitochondrion.
 - 2.2. Golgi apparatus.
3. Study of some inactive cytoplasmic inclusions:
 - 3.1. Hepatocytes glycogen.
 - 3.2. Proteins in secreting cells and lipid inclusions.
4. Study of some animal tissue types:
 - 4.1. Epithelial tissue.
 - 4.2. Connective tissue.
 - 4.3. Muscular tissue.
5. Study of some protozoa types.
6. Study of metosis and meiosis steps.
7. Study of human chromosomes, giant chromosomes, sex chromatin body (Barr body), and some Drosophila Melanogator mutations.
8. Study of sexual and asexual reproduction types.
9. Embryonic growth in urchin.

10. Embryonic growth in frogs.

11. Embryonic growth in birds

B. Biochemistry (1) Course (second year-second semester):

Class Section Topics:

1. Water and minerals.
2. Protein structure and function:
 - 2.1. Amino acids.
 - 2.2. Peptides.
 - 2.3. Structural and functional proteins.
 - 2.4. Enzymes.
3. Bioenergetics and ATP role.
4. Physiologically important carbohydrates:
 - 4.1. Citric acid cycle.
 - 4.2. Glycolysis and pyruvate oxidation.
 - 4.3. Glycogen metabolism.
 - 4.4. Glucogenesis.
 - 4.5. The pentose phosphate pathway.
5. Lipids:
 - 5.1. Fatty acids synthesis.
 - 5.2. Fatty acids oxidation.
 - 5.3. Glycerides and sphingolipids metabolism.
 - 5.4. Cholesterol synthesis.

Lab Section Topics:

- First chapter: General Introduction.
 1. Introduction to the principles of work in biochemistry laboratory:
 - 1.1. General principles for biochemistry inquiry methods.

2. General laboratory methods:
 - 2.1. Dialysis and ultrafiltration methods.
 - 2.2. Electrophoresis methods.
 - 2.3. Chromatography methods.
 - 2.4. Immunochemical methods.
 - 2.5. Centrifugation methods.
 - 2.6. Biological particles interactions.
 - 2.6.1. Enzymes.
 - 2.6.2. Cell membrane receptors and carriers.
 - 2.7. Methods that use radioisotopes.
- Second Chapter:
 3. Protein analysis:
 - 3.1. Protein separation and purification.
 - 3.2. Protein dissipation and determination of its properties.
 4. Amino acids analysis:
 - 4.1. Amino acids dissipation and identification.
 - 4.2. Amino acids sequencing in dipeptides and tripeptides.
 5. Methods of enzyme activity study:
 - 5.1. Enzyme extraction methods.
 - 5.2. Enzymatic assays by color and kinetic methods.
 6. Properties of cell surface receptors and carriers:
 - 6.1. Quantitative forms for receptor-related connection.
 - 6.2. Cell membrane transport.
 - 6.3. Physical diffusion.
 - 6.4. Inactive transport.
 - 6.5. Active transport and ion channels.
 - 6.6. Receptor-mediated endocytosis.
 7. Determination of lipids' properties:

- 7.1. Lipid isolation and extraction.
- 7.2. Lipids identification and calibration methods.
- 7.3. Determining the properties and distribution of fatty acids and triglycerides.
- 7.4. Cholesterol: extraction, detection and assay.
8. Carbohydrates analysis methods:
 - 8.1. Carbohydrates reductive reactions.
 - 8.2. Oxidation by periodates.
9. Nucleic acids isolation and detection:
 - 9.1. DNA isolation and determination of its properties.
 - 9.2. RNA isolation and determination of its properties.
10. Vitamins calibration in food and biological liquids:
 - 10.1. Vitamin A.
 - 10.2. Vitamin C.
11. Methods of analysis using radioisotopes:
 - 11.1. Identification and calibration of radioactivity.
 - 11.2. Scientific aspects to calculate radioactivity and analyze data.
 - 11.3. Safety aspects.
 - 11.4. Radioisotopes applications in biological sciences.

C. Biochemistry (2) Course(third year-first semester):

1. Protein and amino acids metabolism:
 - 1.1. Amino acid synthesis.
 - 1.2. Protein and amino acids' nitrogen catabolism.
 - 1.3. Amino acids' carbon body catabolism.
 - 1.4. Amino acids' conversion to specific products.
 - 1.5. Porphyrin and bile pigments.

2. Vitamins:
 - 2.1. Structure and function of water-soluble vitamins.
 - 2.2. Structure and function of lipid-soluble vitamins.
3. Hormones:
 - 3.1. Pituitary hormones.
 - 3.2. Thyroid hormones.
 - 3.3. Calcium stasis hormones.
 - 3.4. Adrenal cortex hormones.
 - 3.5. Adrenal medulla hormones.
 - 3.6. Sexual hormones.
 - 3.7. Pancreas and gastrointestinal (GI) hormones.
4. Digestion and absorption.

D. Parasitology and Mycology Course (third year- first semester):

Class Section Topics:

1. General introduction:
 - 1.1. General definitions.
 - 1.2. Infection of parasites.
 - 1.3. Development of parasites.
 - 1.4. Intermediate hosts.
 - 1.5. Reproduction of parasites.
 - 1.6. Pathogenic effects of parasites.
 - 1.7. Body response to parasites.
 - 1.8. Immunity in parasitic diseases.
 - 1.9. Antigens and antibodies in parasites.
 - 1.10. Geographic prevalence of parasites.
 - 1.11. Epidemiology.

1.12. Diagnosis of parasitic diseases.

1.13. Treatment and protection of parasitic diseases.

1.14. Classification of parasites.

1.15. Nomenclature of parasites.

2. Protozoa:

2.1. Pathogenic amoebae, free-living amoebae, nonpathogenic amoebae, amoebiasis.

2.2. Sporozoa, malaria, toxoplasmosis, isospora, Bebsia.

2.3. Flagellates:

a. Intestinal Flagellates, Giardia, Trichomonas hominis, Chilomastix mesnili, Enteromonas huminis, and Retortamonas intestinalis.

b. Urogenital flagellates, Trichomonas vaginalis.

c. Blood and tissues flagellates: Trypanosomiasis, Leishmaniasis.

2.4. Ciliates.

3. Helminthes:

3.1. Nematodes: Ascaris Lambricoids, Enterobius Vermicularis, Trichuris Trichiura, Ancylostoma, Strongyloides Stercoralis, Trichomonas spiralis, Filariae, zoological Nematodes infecting human.

3.2. Trematodes: intestinal flukes, lung flukes, liver flukes, Schistosoma.

3.3. Cestodes: Taenia saginata, Taenia solium, Hymenolepis, Echinococcus, Diphyllbothrium, other Cestodes.

3.4. Phylum Annelida.

4. Arthropods:

4.1. Properties of Arthropods, types, classification.

4.2. Insects, Apterygota, Hemiptera, Diptera and Orthoptera.

4.3. Araneae.

4.4. Insecticides.

5. Fungi:

5.1. General definitions, fungi structure, proliferation, physiology, nutrition, metabolism and types.

- 5.2. Laboratory diagnosis of fungi.
- 5.3. Dermatophytosis, cutaneous mycoses.
- 5.4. Mycomycetes and candidiasis.
- 5.5. Aspergillosis.
- 5.6. Visceral mycosis and types of mycosis.

Lab Section Topics:

1. Examination of stool specimens:
 - 1.1. Direct wet film and stained slides.
 - 1.2. Identify the microscopic natural elements found in the stool.
 - 1.3. Study of the intestinal parasites found in stool: helminthes eggs, monocytes.
2. Examination of blood specimens:
 - 2.1. Staining techniques of blood preparations.
 - 2.2. Identify the microscopic natural elements found in the blood smear.
 - 2.3. Study of blood parasites.
3. Abscesses examination for parasites.
4. Parasitic examination of other pathogenic specimens.
5. Different types of fungi:
 - 5.1. Direct examination.
 - 5.2. Examination of KOH preparations.
 - 5.3. Post staining examination
 - 5.4. Study of fungal cultures.
6. Parasites immunological reactions: different applications.
7. Identify the Insect vectors of infectious and parasitic diseases to human.

E. Bacteriology and Virology Course (third year- second semester):

Class Section Topics:

1. General Bacteriology:
 - 1.1. Introduction to bacteriology.
 - 1.2. Structure of bacterial cell.
 - 1.3. Chemical structure of bacterial cell.
 - 1.4. Bacterial physiology.
 - 1.5. Bacteria reproduction and growth.
 - 1.6. Atypical shapes of bacteria.
 - 1.7. Bacteriophage.
 - 1.8. Bacterial genetics.
 - 1.9. Relation between bacteria and host.
 - 1.10. Bacterial pathogenesis.
 - 1.11. Bacterial disease and epidemics.
 - 1.12. Bacterial immunities.
 - 1.13. Laboratory diagnosis of bacterial disease.
 - 1.14. Bacterial disease treatment and protection.
2. Human pathogenic bacteria:
 - 2.1. Gram-positive cocci (Streptococci, Staphylococci).
 - 2.2. Gram-positive bacilli.
 - 2.3. Anaerobic spore and non-spore bacteria.
 - 2.4. Gram-negative cocci (Neisseria).
 - 2.5. Gram-negative bacilli (enterobacteriaceae).
 - 2.6. Vibrio, Campylobacter, Helicobacter.
 - 2.7. Pseudomonas and some Gram-negative bacilli.
 - 2.8. Haemophilus and Bordetella.
 - 2.9. Francisella, Pasteurella, and Legionella.
 - 2.10. Brucella and Bartonella.

- 2.11. *Mycoplasma*, *Chlamydia*, *Rickettsia*.
 - 2.12. *Spirochetes* (*Treponema*, *Borrelia*, *Leptospira*).
 - 2.13. Alcohol and acid resistant bacteria.
 - 2.14. Bacteria common between human and animal.
 - 2.15. Normal flora.
3. Human pathogenic viruses:
- 3.1. Viruses: properties, structure, and classification.
 - 3.2. Viral replication.
 - 3.3. Culture and isolation of viruses.
 - 3.4. Human viral infections, treatment by interferon and antiviral agents.
 - 3.5. Protection from viruses: vaccinations, physical and chemical protection.
 - 3.6. Viral diagnosis using molecular pathology methods.
 - 3.7. Prions: structure, features, disease and diagnosis.
 - 3.8. Orthomyxoviruses and paramyxoviruses (Influenza, mumps, measles, respiratory syncytial fever (RSV), Newcastle, Rubella, Parainfluenza).
 - 3.9. Picornaviruses (Polioviruses, Echoviruses, Coxsackie viruses, Rhinoviruses).
 - 3.10. Rhabdoviruses and Reo viruses (Rabies virus...).
 - 3.11. Toga viruses (Yellow fever, Dengue virus, Encephalitis viruses).
 - 3.12. Poxviruses (smallpox viruses, Vaccinia viruses).
 - 3.13. Herpes viruses (Simplex, Chickenpox, Epstein-Barr, Cytomegalovirus (CMV)).
 - 3.14. Adenovirus, Pappovirus and carcinogen viruses.
 - 3.15. Hepatitis viruses (A, B, C, D, E, G).

Lab Section Topics:

1. Working in the bacterial laboratory.
2. Sterilization and its types.
3. Bacterial culture media.

4. Bacterial examination samples.
5. Morphology of bacteria and their colonies.
6. Biochemical tests.
7. Bacterial typing.
8. Tests of experimental pathogenicity.
9. Bacterial classification and nomenclature.
10. Immunological methods for indirect bacterial diagnosis.
11. Susceptibility testing.
12. Detection of viruses in environmental and living media

F. Hematology and Immunology Course (fourth year-second semester):

Class Section Topics:

- Hematology:
 1. Blood cells:
 - 1.1. Blood components: blood cells' origin and formation.
 - 1.2. Red blood cells: origin, metabolism, hemoglobin types, shapes and functions.
 - 1.3. White blood cells: origin, types, metabolism, shapes and functions.
 - 1.4. Platelets: origin, structure, metabolism, and functions.
 - 1.5. Bone marrow study: bone marrow aspiration; indications and study.
 - 1.6. Red blood cells diseases: anemia, polycythemia.
 - 1.7. White blood cells diseases: non-malignant white blood cells diseases, acute and chronic leukemia.
 - 1.8. Lymph system diseases: malignant lymph tumors, splenomegaly.
 2. Hemostasis:
 - 2.1. Study of primary and secondary hemostasis.
 - 2.2. Primary hemostasis diseases.
 - 2.3. Secondary hemostasis diseases.

3. Immune hematology:

- 3.1. Red blood cells blood groups.
- 3.2. White blood cells and platelets blood groups.
- 3.3. Blood transfer and collection tests, treatment by blood transfer.
- 3.4. Interactions and immunological complications due to blood transfer.
- 3.5. The clinical and laboratory aspects of newborn hemolysis.

• Immunology:

1. Basic immunity:

- 1.1. Natural immunity and defense cells.
- 1.2. Antigens and antigenicity.
- 1.3. Antibodies and humoral immunity.
- 1.4. Complement system and kinin system.
- 1.5. Cell-mediated immunity.
- 1.6. Cellular and humoral immunologic tests.

2. Immunological monitoring:

- 2.1. Immune response mechanism.
- 2.2. Inflammatory response and its role.
- 2.3. Hypersensitivity: types and diseases.
- 2.4. Cytokines.
- 2.5. Immune response monitoring.
- 2.6. Immunity and carcinogenesis monitoring.

3. Immunity and diseases:

- 3.1. Immunity in bacterial, parasitic, and viral infections.
- 3.2. Immune deficiency diseases.
- 3.3. Autoimmune diseases.
- 3.4. Systemic immune diseases.
- 3.5. Immunity and organ transplantation.
- 3.6. Immune treatment.

Lab Section Topics:

1. Sampling.
 2. Tools used in blood withdrawal and anticoagulants.
 3. Sedimentation rate.
 4. Red blood cells count.
 5. Reticulocytes count.
 6. Hemoglobin assay.
 7. Detection of hemoglobin in urine.
 8. Detection of occult blood in stool.
 9. Hematocrit assay.
 10. Blood cells stains and staining methods.
 11. White blood cells count.
 12. Examination of the blood film and hemogram reading.
 13. Identification of irregular red blood cell shapes.
 14. Sickle test.
 15. Bleeding and clotting time.
 16. Test of capillaries resistance.
 17. Clot retraction test.
 18. Prothrombin time (PT).
 19. Partial activated prothrombin time PTT.
 20. Blood groups (ABO) and sub-groups by serological and corpuscles tests.
- *Some scientific principles of blood tests:*
 1. Identification of immature blood corpuscle.
 2. Ferrum staining erythrocytes (Pearls Test).
 3. Direct Coombs test.
 4. Indirect Coombs test.
 5. Irregular antibodies detection and their type's specification.
 6. Calibration of natural regular antibodies.

7. Cold antibodies calibration.
8. Crossing test.
9. Fibrinogen calibration.
10. Clotting factors calibration.

F. Molecular Biology Course (fifth year-first semester):

Class Section Topics:

1. Cells, macro molecules, proteins structure.
2. The properties of nucleic acids:
 - 2.1. The structure.
 - 2.2. Physical and chemical properties.
 - 2.3. Optical and thermal properties.
 - 2.4. DNA Supercoiling.
3. DNA Replication:
 - 3.1. General overview of chromosome structure.
 - 3.2. Replication in bacteria.
 - 3.3. The cellular cycle.
 - 3.4. Replication in eukaryotes.
4. Damaging, repairing, and reactivation of DNA:
 - 4.1. Mutagens.
 - 4.2. DNA Damaging.
 - 4.3. DNA Repairing.
 - 4.4. DNA Reactivation.
5. Gene manipulation:
 - 5.1. DNA colonization.
 - 5.2. Plasmid DNA preparation.
 - 5.3. Enzymes of preparation and DNA electrophoresis.

- 5.4. Confusion, transformation and analysis of recombinant DNA.
6. Cloning carriers:
 - 6.1. Carriers designing.
 - 6.2. Bacteriophage as carriers.
 - 6.3. Cosmids.
 - 6.4. Carriers of eukaryotes.
7. Genetic libraries and probing:
 - 7.1. DNA libraries.
 - 7.2. cDNA libraries.
 - 7.3. Probing methods.
8. Cloned DNA analysis and uses:
 - 8.1. Cloning properties.
 - 8.2. Determination of DNA sequencing.
 - 8.3. PCR.
 - 8.4. Organization and arrangement of cloned genes.
 - 8.5. Mutations in cloned genes.
 - 8.6. Applications of cloning.
9. Transcription in prokaryotes and its organization:
 - 9.1. Lac operon.
 - 9.2. trp operon.
 - 9.3. Organization of transcription using alternative σ factors.
10. Transcription in eukaryotes and its organization:
 - 10.1. Properties and functions of RNA polymerase.
 - 10.2. (I, II, III) genes of RNA polymerase.
 - 10.3. Important factors of transcription.
 - 10.4. Examples for transcription organization.
11. Genetic code, tRNA, protein synthesis:
 - 11.1. Steps of protein synthesis.

- 11.2.Mechanism of protein synthesis.
- 11.3.Beginning codes in eukaryotes.
- 11.4.Translation control and post-translation actions.
- 12.Bacteriophages and viruses of eukaryotes:
 - 12.1.Introduction to viruses.
 - 12.2.Bacteriophages.
 - 12.3.DNA viruses.
 - 12.4.RNA viruses.
- 13.Oncogenes:
 - 13.1.Oncogenes in oncoviruses.
 - 13.2.Oncogenes classification.
 - 13.3.Tumor inhibitor genes.
 - 13.4.Apoptosis.
- 14.Molecular biology techniques and applications used in medical practice:
 - 14.1.Techniques of isolating nucleic acids and detecting them in medical diagnostic tests.
 - 14.2.Prebirth diagnosis.
 - 14.3.Diagnosis of postbirth genetic diseases.
 - 14.4.Diagnosis and typing of viral diseases.
 - 14.5.Diagnosis and typing of bacterial diseases.
 - 14.6.Genetic therapy.

G. Clinical Biochemistry Course (fifth year-second semester):

Class Section Topics:

1. Introduction to general principles and units.
2. Lab safety.
3. Lab quality assurance.
4. Enzymatic-radiologic immunoassays.

5. Pathological mechanisms of metabolims:
 - 5.1. Pathogenesis of proteins and amino acids metabolism.
 - 5.2. Pathogenesis of saccharides metabolism.
 - 5.3. Clinical enzymes.
 - 5.4. Pathogenesis of lipids and lipoproteins metabolism.
 - 5.5. Pathogenesis of purine and pyrimidine metabolism.
 - 5.6. Pathogenesis of porphyrins metabolism.
 - 5.7. Pathogenesis of vitamins metabolism.
 - 5.8. Water and electrolytes (Na, K...), blood gases.
 - 5.9. Base-acid balance.
 - 5.10. Magnesium, calcium and phosphate.
 - 5.11. Trace elements.
6. Pathological mechanisms of systems and organs:
 - 6.1. Liver and bile tracts.
 - 6.2. Gastrointestinal tract: stomach, pancreas, and intestines.
 - 6.3. Kidneys and urinary tract.
 - 6.4. Heart and skeletal muscles.
 - 6.5. Blood and abnormal hemoglobins.
 - 6.6. Coagulation system.
 - 6.7. Endocrine glands and hormones.
 - 6.8. Nervous system.
 - 6.9. Bones and connective tissues.
 - 6.10. Cancer, carcinogens, tumor markers.
 - 6.11. Mechanism of inflammation.
 - 6.12. Newborn metabolic genetic hereditary defaults.
 - 6.13. Mechanisms of atherosclerosis.
 - 6.14. Mechanisms of hypertension.
 - 6.15. Drugs metabolism.

6.16.Poisonings.

6.17.Pregnancy and prebirth stage.

Lab Section Topics:

1. Methods and solutions used in clinical chemistry.
2. Samples collection.
3. Solutions and international units.
4. Quality assurance in clinical laboratory.
5. Enzymatic-radiologic immunoassays.
6. Enzymes purification.
7. Liver function tests.
8. Gastrointestinal function tests.
9. Renal function tests.
- 10.Carbohydrates metabolism tests
- 11.Non protein Nitrogen metabolism tests.
- 12.Nucleic Acids metabolism tests.
- 13.Lipids metabolism tests.
- 14.Amino acids metabolism tests.
- 15.Proteins metabolism and serum electrophoresis tests.
- 16.Erythrocytes metabolism tests.
- 17.Porphyrins metabolism tests.
- 18.Hormones metabolism tests.
- 19.Vitamin metabolism tests.
- 20.Enzymes metabolism tests.
- 21.Mineral metabolism tests.
- 22.Drugs and poisons metabolism tests.
- 23.Biological fluids:
 - Seminal fluid.

- Exudates/ transudates.
- Synovial fluid.
- Cerebrospinal fluid.

H. Biotechnology Course(fifth year- second semester):

1. Genetic engineering.
2. Biopharmaceutical dosage forms.
3. Mutations of medical plants.
4. Quality control for biological drugs.
5. Vaccines and serums.

I. Biostatistics Course (third year- second semester):

1. Concept of statistics and its relation with other sciences.
2. Statistical scientific research and its basic steps.
3. Measures of central tendency (means).
4. Measures of dispersion, Skewness and Kurtosis.
5. Principles and rules of the possibilities.
6. Probability Distributions.
7. Sampling Distributions.
8. Statistical inference of large-sized samples.
9. Statistical inference of small-sized samples (t- distribution).
10. Statistical hypothesis tests using X^2 -distribution.
11. Analysis of variance using F-distribution.
12. Basics of correlation and regression in the study of some medical and pharmaceutical cases.
13. Some nonparametric statistical methods.
14. Statistical methods for quality control.
15. Biological and health statistics.

Details of Pharmaceutical Chemistry and Quality Control of
Medicaments Department Courses

A. General And Inorganic Chemistry Course (first year- first semester):

Class Section Topics:

1. General introduction.
2. Structure of matter:
 - 2.1. Atoms and molecules.
 - 2.2. Atomic and molecular mass.
 - 2.3. States of matter.
3. Atoms:
 - 3.1. Electronic structure of atom.
 - 3.2. Nucleus, radioactivity and nuclear energy.
4. Molecules: Valence.
5. Chemical bonds:
 - 5.1. Chemical bonds between two atoms.
 - 5.2. Metal bonds.
 - 5.3. Ionic bonds.
 - 5.4. Molecular bonds according to valence.
 - 5.5. Physical and chemical characteristics of bonds.
6. Chemical reactions:
 - 6.1. Chemical thermodynamics.
 - 6.2. Chemical balance.
7. Kinetics of chemical reactions:
 - 7.1. Study of reaction rate.
 - 7.2. Intermediates in chemical reactions.

8. Solutions:

- 1.1. Equilibrium in solutions and acid-base reactions.
- 1.2. Oxidation-reduction reactions.
- 1.3. Precipitation reactions and complex formation.

9. Periodic classification of elements:

- 9.1. An idea on periodic table.
- 9.2. Study of single elements.
- 9.3. Study of metal groups and their derivatives.

10. Complexes:

- 10.1. Metal compounds.
- 10.2. Simple and complex salts.
- 10.3. Dissociation of complexes.

Lab Section Topics:

1. General instructions on rules of lab work.
2. Some practical applications in thermal chemistry:
 - 2.1. Measuring heat dissipated in chemical reactions.
 - 2.2. Use of calorimetry in determination of heat amount.
 - 2.3. Methods of determining specific heat
3. Qualitative analysis of cations (positive metallic ions):
 - 3.1. Detection and separation of first category metals.
 - 3.2. Detection and separation of second category metals.
 - 3.3. Detection and separation of third category metals.
 - 3.4. Detection and separation of fourth category metals.
 - 3.5. Detection and separation of fifth category metals.
 - 3.6. Detection and separation of sixth category metals.

4. Qualitative analysis of anions:

- 4.1. Properties and detection of first group anions.
- 4.2. Properties and detection of second group anions.
- 4.3. Properties and detection of third group anions

5. Volumetric titration of solutions:

- 5.1. Practical experiments using acid-base meter.
- 5.2. Practical experiments using oxidation-reduction meter.
- 5.3. Practical experiments using EDTA.

6. The use of some qualitative and quantitative analysis methods:

- 6.1. Practical experiments using spectrophotometer.
- 6.2. Practical experiments using potentiometer.
- 6.3. Practical experiments using chromatography

B. Organic Chemistry (1) Course(first year- second semester):

Class Section Topics:

I. General Organic Chemistry:

1. Introduction to carbon skeleton forms, functional groups, classes of organic compounds, and carbon atom bonds.
2. Types of functional positional isomerism, Z/E isomerism, photoisomerism.
3. Inductive and mesomeric actions through organic bonds.
4. Rules of organic compound nomenclature.
5. Some important aspects of the organic reactions: electrons and structural aspects including homogenous and heterogenous breakage of bonds, structure of intermediate compounds (carbocation, carbanion, and free radicals), and the concept of ionic and radical reactions.
6. A quick glimpse on spectroscopy methods used in recognition of organic compounds: infrared spectroscopy, nuclear magnetic resonance spectroscopy, ultraviolet spectroscopy, and mass spectroscopy.

II. Study of Aliphatic Chains:

7. Hydrocarbons.
8. Ethylene and diethylene hydrocarbons.
9. Acetylene hydrocarbons.
10. Halogenic derivatives.
11. Metallic-organic compounds.
12. Alcohols and polyalcohols
13. Ether oxides.
14. Thiols.
15. Amines, diamines, and aminoalcohols.
16. Quaternary ammonium compounds.
17. Carbonyl groups: aldehydes and ketones.
18. Polyfunctional carbon derivatives.
19. Carboxylic acids and their derivatives: acid halides, acid anhydrides, esters, amides, and nitriles.
20. Polyfunctional acids.
21. Quaternary valence groups: nitrogen and non-nitrogen derivatives of carbon acid.
22. Carbohydrates.

Lab Section Topics

1. Introduction.
2. Lab tools and devices.
3. Some lab work and techniques.
4. Determination of melting point.
5. Determination of boiling point.
6. Repeated crystallization.
7. Sublimation.
8. Simple distillation.
9. Low pressure distillation.

10. Steam distillation.
11. Extraction.
12. Qualitative analysis of elements in organic materials.

C. Organic Chemistry (2) Course (second year- first semester):

Class Section Topics:

I. Non-aromatic cyclic chains:

1. Cyclans and their derivatives.
2. Steroids.
3. Aromatic chains

II. The aromatic chain:

4. The aromatic property of benzene ring and its activity.
5. Aromatic hydrocarbons.
6. Halogen derivatives.
7. Aryl sulfonic acids and their chlorides.
8. Aromatic nitro derivatives.
9. Phenols.
10. Polyphenols: benzene diphenol, benzene triphenol, nitrophenols, aminophenols.
11. Aromatic amines.
12. Polyamines.
13. Diazo compounds.
14. Aromatic carbon derivatives: aldehydes and ketones.
15. Polyfunctional carbonic derivatives: aldehydes, ethylene ketones, diketones, and phenylketones and their derivatives.
16. Quinines.
17. Monoacid aromatic acids and their derivatives.

18. Polyfunctional acids: benzo-dicarboxylic acids, phenolic acids, sulfated aromatic acids and amino aromatic acids.

19. Stains: nitrophenols, azo stains, and phthalins.

20. Heterocycles.

Lab Section Topics:

1. Introduction.
2. Information about the lab work, risks, and precautions.
3. Study of functional organic compounds:
 - 3.1. Preparation of some organic compounds.
 - 3.2. Detection of some chemical functions, and preparation of some of their derivatives.
4. Separation of some organic mixtures to their individual components.
5. Study of some organic structures and skeletons spatially using molecular models (stereochemistry).

D. Drug Synthesis Course (third year- second semester):

Class Section Topics:

1. Memorizing the most important chemical reactions used in drug synthesis.
2. Study of some general methods in drug synthesis related to:
 - 2.1. Aliphatic aromatic derivatives.
 - 2.2. Beta lactam derived compounds.
 - 2.3. Polycyclic aromatic derivatives (naphthalene, anthracene, phenanthrene, and others).
 - 2.4. Heterocyclic derivatives (pyridines, pyrimidines, piperazines, and others).
 - 2.5. Metallic-organic derivatives.
 - 2.6. Derivatives of some other chemical structures .

3. Study of some spectroscopic methods used in structure determination of medicinal compounds:
 - 3.1. Infrared spectroscopy (IR)
 - 3.2. Nuclear magnetic resonance spectroscopy (NMR).
 - 3.3. Ultraviolet spectroscopy (UV).
 - 3.4. Mass spectroscopy (MS).

Lab Section Topics:

1. General instructions about lab safety.
2. Memorizing some basic operations in drug synthesis: extraction, repeated crystallization, and others.
3. Preparation of some medicinal compounds belonging to:
 - 3.1. Sulfamides (sulfanilamides, sulfasalazine).
 - 3.2. Aromatic alkyl amines (amphetamines).
 - 3.3. Antiseptic halogen derivatives (chloroform).
 - 3.4. Quaternary ammonium compounds (choline).
 - 3.5. Phenol derivatives.
 - 3.6. Pyridine derivatives (nifedipine).
 - 3.7. Cycloheptadine derivatives (diazepam).
 - 3.8. Coumarin derivatives (thromboxane, warfarin).
 - 3.9. Pyrazole derivatives (phenylbutazone).
 - 3.10. Antiepileptic hydantoin derivatives (phenytoin).
 - 3.11. Antihyperlipidemic aromatic alkyl ether derivatives (calcium clofibrate).
4. Separation of medicinal compound mixtures.
5. Works directed in medicinal spectroscopy.

E. Pharmaceutical Chemistry (1) Course (third year- second semester):

Class Section Topics:

• Inorganic Section:

1. Introduction to nomenclature of inorganic compounds and periodic table of elements.
2. Periodic table groups and their important derivatives in pharmacy.
3. Important metallic-organic compounds in pharmacy.

• Organic Section:

- I. Study of compounds or derivatives that are pharmaceutically or medically important according to the following classification:
 1. Hydrocarbons.
 2. Halogenic derivatives.
 3. Alcohols.
 4. Ethers.
 5. Aldehydes.
 6. Ketones.
 7. Opened and aromatic carboxylic acids.
 8. Alkyl, alcoholic and aromatic amines.
 9. Opened and closed amides and polyamides.
 10. Phenols.
 11. Amino acids and proteins.
 12. Aromatic sulfonic acids.
 13. Carbohydrates.
 14. Antibacterial sulfamides.
- II. Study of some medicinal compounds belonging to:
 15. Local anesthetics.
 16. Drugs of the digestive system: emetics and anti-emetics, hyperacidity modifiers, digestive enzymes and their inhibitory drugs, hepatic drugs, antiparasitic and antifungal drugs.

17. Drugs of the respiratory system: anti-cough, expectorants, and anti bronchial-spasm.
18. Cardiac drugs: antiarrhythmic drugs, cardiovascular drugs, and blood lipolytic drugs.
19. Vitamins.

Lab Section Topics

1. Metallic section:

- 1.1. Methods of qualitative analysis for pharmaceutically important elements in primary and secondary groups of the periodic table.
- 1.2. Methods of quantitative analysis for pharmaceutically important elements in primary and secondary groups of the periodic table.

2. Organic section:

General glimpse on qualitative and quantitative analysis for pharmaceutical and medicinal organic compounds belonging to:

- 2.1. Hydrocarbons.
- 2.2. Halogenic derivatives: revision of some members.
- 2.3. Monoalcohols and polyalcohols.
- 2.4. Phenols: revision of some members.
- 2.5. Aliphatic and aromatic amines and their derivatives (local anesthetics): revision of some members
- 2.6. Aldehydes: revision of some members.
- 2.7. Organic acids and their derivatives: general detection and calibration methods for: monocarboxylic aliphatic acids, aromatic acids, amino acids, keto acids, and aldehydic acids, esters, lactones, anhydrides, imides and nitriles.
- 2.8. Sulfuric organic compounds: sulfuric acids, antibacterial sulfamides.
- 2.9. Urea and its derivatives.
- 2.10. Carbohydrates: monosaccharides, disaccharides and trisaccharides.

F. Pharmaceutical Chemistry (2) Course (fourth year- first semester):

Class Section Topics:

Study of medicinal compounds belonging to:

1. Analgesics, antipyretics, nonsteroidal anti-inflammatory drugs (NSAIDs): phenolic acids and their derivatives, pyrazole derivatives, enthranilic acid derivatives, quinoline derivatives, Indole derivatives, phenothiazine derivatives, aromatic alkyl acids derivatives.
2. Drugs of gout and hyperuricemia.
3. Central analgesics: morphine and its derivatives, central and industrial analgesics.
4. Natural and industrial sympathetic nervous system stimulants.
5. Parasympathetic nervous system antagonists: atropine and its metabolites, and synthetic antagonists.
6. Antihistamines.
7. Psychologic drugs: Psychologicinhibitors (hypnotics, tranquilizers, antiepileptics), Antipsychotics, Psychologic stimulants, and antidepressants.
8. Diuretic sulfamides and some other diuretics.
9. Hypoglycemic sulfamides.
10. Antiseptics and antiparasitic drugs: drugs of malaria.
11. Tuberculosis drugs.
12. Antibiotics of peptide and saccharide structure, quaternary cyclic (tetracyclines), macrolides, antifungals.
13. Steroidal hormones.
14. Anticancer drugs.
15. Coagulants , anticoagulants and anti-vitamin K, and other compounds.

Lab Section Topics:

1. Identification and purity meters for medicinal organic compounds.
2. Methods of organic medicinal compounds assay.

3. Identification, purity determination, and assay of following medicinal organic compounds and derivatives:
 - 3.1. Phenolic acids and their derivatives: aspirin.
 - 3.2. Pyrazole derivatives: antipyrine, pyrazolone, phenylbutazone.
 - 3.3. Morphine and its derivatives: morphine chlorhydrate, nalorphine chlorhydrate, codeine phosphate.
 - 3.4. Beta phenyl ethyl amine derivatives: adrenaline tartrates.
 - 3.5. Atropine and its salts.
 - 3.6. urethans: some members.
 - 3.7. Benzodiazepine derivatives: some members.
 - 3.8. Phenothiazine derivatives: some members.
 - 3.9. Diuretic sulfamides: acetazolamide
 - 3.10. Quinolone derivatives: some members.
 - 3.11. Isoniazide and sodium para-aminosalicylic acid.
 - 3.12. Penicilines: some members.
 - 3.13. Chloramphenicol and its salts.
 - 3.14. Streptomycin and its salts.
 - 3.15. Tetracyclines and their salts.
 - 3.16. Steroidal hormones: some members.

G. Medicament Quality Control Course(fifth year-first semester):

Class Section Topics:

1. General introduction.
2. Stages of testing and registration of new medicaments.
3. Medicaments quality control in pharmaceutical companies:
 - 3.1. The technical structure of pharmaceutical company.
 - 3.2. Good manufacturing practice of drugs.
4. basic definitions:

- 4.1. Quality policy.
- 4.2. Quality management.
- 4.3. Quality control.
- 4.4. Validation.
- 4.5. Self- inspection.
- 4.6. Quality review.
5. Control of the basic quality variables:
 - 5.1. Raw materials.
 - 5.2. Production processes during manufacturing.
 - 5.3. Packaging materials.
 - 5.4. Labeling materials.
 - 5.5. Final pharmaceutical dosage form.
6. Analytical plan:
 - 6.1. Validation principles of the analytical method.
 - 6.2. Sampling.
 - 6.3. Samples preparation.
 - 6.4. Samples analysis.
 - 6.5. Collecting the results and testing them statistically.
7. Testing the technological features of pharmaceutical preparations during manufacturing.
8. Pharmacopeial tests monographs for raw materials and pharmaceutical dosage forms.
 - 8.1. Good laboratory practices.
 - 8.2. Drugs identification methods.
 - 8.3. General and specific purity test methods.
 - 8.4. Assay methods.
9. Microbiological laboratory:
 - 9.1. Sterility test.

9.2. Microbial limit test.

9.3. Microbiological assay for some drugs (Antibiotics – Vitamins).

10. Biological laboratory:

10.1. Pyrogen test.

10.2. Fatigue-causing substances test.

10.3. Chronic and acute toxicity test.

10.4. Hormones assay.

11. Containers test:

11.1. Glass.

11.2. Plastic.

11.3. Metals.

11.4. Papers.

12. Stability tests:

12.1. Good storage practices.

12.2. Accelerated tests.

12.3. Long-term tests.

12.4. Follow-up tests.

13. Drugs bioequivalence test.

Lab Section Topics:

1. Explaining good laboratory practices (GLPs).
2. Explaining the sampling methods, preparing the samples of pharmaceutical materials and dosage forms, and the method of statistical data processing.
3. Identification test of some medical substances in pharmaceutical dosage forms:
 - 3.1. Sodium chloride in serum solutions (salt serum).
 - 3.2. Atropine sulfate in tablets.
 - 3.3. Salicylic acid in ointments and creams.
 - 3.4. A mixture of amino glycoside antibiotics.

4. Purity tests:
 - 4.1. Detecting lead in Sucrose.
 - 4.2. Detecting Salicylic acid in Aspirin.
 - 4.3. Detecting Para amino phenol in Paracetamol.
5. Volumetric or gravimetric analytical applications:
 - 5.1. Gravimetric calibration applications: determination of Sodium chloride in parenteral solutions.
 - 5.2. Volumetric calibration applications:
 - A. In tablets: Aspirin calibration in the aqueous medium.
 - B. In tablets: Nicotinamide calibration in the non-aqueous medium.
 - C. Ascorbic acid calibration in syrups by using redoximetry.
 - D. Zinc oxide calibration in ointments by using complexometry.
 - H. Potassium chloride calibration in parenteral solutions by using precipitometry.
 - 5.3. Spectral analysis methods applications:
 - A. The calibration of Vitamin B₂ in capsules by using visible spectrophotometer.
 - B. The calibration of Paracetamol in tablets by using U.V. spectrophotometer.
 - 5.4. Chromatographic methods applications: the calibration of diclofenac in parenteral solutions by using liquid chromatography.
6. Pharmaceutical dosage forms physical test:
 - A. Disintegration test of Diclofenac enteric coated tablets.
 - B. Dissolution test of Diazepam tablets.
7. Physical test of plastic and glass containers.

H. Medicinal Chemistry Course (fifth year- first semester):

1. Central nervous system drugs.
2. Autonomic nervous system drugs
3. Cardio vascular drugs.

4. Anti-allergic, immunity and inflammatory drugs.
5. Endocrinal drugs.
6. Coagulation drugs.
7. Metabolic modifiers (diabetes drugs, anti-hyperlipidemic agents, goat drugs).
8. Antibiotics.
9. Antibacterials.
10. Antiviral and cancers drugs.

Details of Pharmacognosy Department Courses

A. Botanical Biology Course (first year-first semester):

Class Section Topics:

1. Plant cell: structure and metabolism:
 - 1.1. Eukaryotic cell.
 - 1.2. Molecular and chemical composition of the plant cell.
 - 1.3. Cellular and energetic exchanges.
 - 1.4. Photosynthesis and respiration.
2. Plant genetics and evolution.
3. Morphological and anatomical study of superior plants:
 - 3.1. Cellular differentiation.
 - 3.2. Study of plant organs.
4. Nutrition and nutrient requirements:
 - 4.1. Plant-water relationships and mineral nutrition.
 - 4.2. Soil: substratum and composition.
 - 4.3. Special types of non-self nutrition.
 - 4.4. Plant growth physiology.
5. Plant proliferation:
 - 5.1. Plant proliferation forms and generations sequence.
 - 5.2. Cultivation of plant cells and tissues.
6. Plant diversity:
 - 6.1. Plant kingdom taxonomy.
7. Environment and plants adaption:

7.1. Plants' role in the environment.

7.2. The plants adaption with environmental conditions.

Lab Section Topics:

1. General introduction.

2. Microscope.

3. Preparation of plant samples.

4. Plant cell structure:

4.1. Study of a living cell and its components.

4.2. Study of lifeless components.

5. Study of cellular differentiation and division.

6. Study of plant tissues:

6.1. Protective tissues.

6.2. Secretive tissues.

6.3. Basic tissues.

6.4. Conducting tissues.

7. Study of plant organs structure :

7.1. Root.

7.2. Stem.

7.3. Leaf.

7.4. Flower.

7.5. Fruit and seed.

8. Plant taxonomy:

8.1. Classification keys.

8.2. Classification of plant categories.

9. Plant physiology and environment:

9.1. Water-plant relationships.

9.2. Impact of physical conditions on plant growth.

9.3. Environmental adaption

B. Pharmacognosy and Pharmacognostical Chemistry (1) Course(second year- second semester):

Class Section Topics:

1. General introduction to Pharmacognosy and medical plants:

1.1. General definitions.

1.2. Sources of botanical-medicinal materials: plant chemistry.

2. Plant and animal kingdoms as drug sources:

2.1. Geographic and biological sources of drugs.

2.2. Bioactive materials from sea sources.

2.3. Medical plants' families and orders:

Thallophytes, Bryophytes, Pteridobhytes, Gymnospermis, angiospermis, Dicotyledones, Monocotyledons.

3. Natural active chemical groups:

3.1. Introduction : extraction systems of medicinal plant drugs:

Detection methods and assays.

3.2. Hydrocarbons: their derivatives and the most important drugs containing them:

Structure, physical and chemical characteristics, extraction, detection and assay.

3.3. Antibiotics and the most important drugs containing them:

Structure, physical and chemical characteristics, extraction, detection and assay.

3.4. Carbohydrates: their derivatives and the most important drugs containing them:

Structure, physical and chemical characteristics, extraction, detection and assay.

3.5. Phenols and phenolic glycosides: biosynthesis and the most important drugs containing them:

Structure, physical and chemical characteristics, extraction, detection and assay.

3.6. Volatile oils and resins: biosynthesis and the most important drugs containing them:

Structure, physical and chemical characteristics, extraction, detection and assay.

Lab Section Topics:

1. General introduction:

1.1. Plant evolution.

1.2. Morphological and histological structures of plants and their evolution.

2. Pharmacognostical examination methods.

3. Microscopic tests of cross-sections and powders:

3.1. Characteristics of leaves' Cross-sections and powders.

3.2. Characteristics of flowers' Cross-sections and powders.

3.3. Characteristics of fruit's Cross-sections and powders.

3.4. Characteristics of stems' Cross-sections and powders.

3.5. Characteristics of roots' Cross-sections and powders.

3.6. Characteristics of rhizomes and tubers' Cross-sections and powders.

C. Pharmacognosy and Pharmacognostical Chemistry (2) Course (third year- first semester):

Class Section Topics:

3. Natural active chemical groups (part two):

3.7. Sabonines: biosynthesis and the most important drugs containing them:

Structure, physical and chemical characteristics, extraction, detection and assay.

3.8. Plant cardio-active agents and other steroids: biosynthesis:

Structure, physical and chemical characteristics, extraction, detection and assay.

3.9. Isoprenoids: biosynthesis and the most important drugs containing them:

Structure, physical and chemical characteristics, extraction, detection and assay.

3.10. Cyanogenic glycosides, glycosinolates, other glycosides and the most important drugs containing them:

Structure, physical and chemical characteristics, extraction, detection and assay.

3.11. Alkaloids: biosynthesis and the most important drugs containing them:

Structure, physical and chemical characteristics, extraction, detection and assay.

3.12. Plant anti-tumors and the most important drugs containing them:

Structure, physical and chemical characteristics, extraction, detection and assay.

3.13. Anti monocytes and the most important drugs containing them:

Structure, physical and chemical characteristics, extraction, detection and assay.

3.14. Anti-hepatotoxic and oral anti-hyperglycemia drugs:

Structure, physical and chemical characteristics, extraction, detection and assay.

3.15. Vitamins, hormones and the most important drugs containing them:

Structure, physical and chemical characteristics, extraction, detection and assay.

3.16. Colorants, condiments and the most important drugs containing them:

Structure, physical and chemical characteristics, extraction, detection and assay.

3.17. Toxic and hallucinating plants:

Structure, physical and chemical characteristics, extraction, detection and assay.

3.18.Plant enzymes:

Structure, physical and chemical characteristics, extraction, detection and assay.

Lab Section Topics:

4. Chemical examinations:

- 4.1. General extraction methods.
- 4.2. Alkaloids extraction methods.
- 4.3. Alkaloids detection and identification.
- 4.4. Alkaloids assay.
- 4.5. Sabonines detection and identification.
- 4.6. Cardiac glycosides detection, identification and assay.
- 4.7. Anthranoids detection, identification and assay.
- 4.8. Detection, identification and assay of flavonoids, tannins and phenols.
- 4.9. Volatile oils extraction, cheating detection and their components assay.
- 4.10.Cumarins detection and assay.
- 4.11.Detection of bitter, latex and spicy materials.
- 4.12.Detection and assay of fats and waxes components.

D. Pharmacy History, Ethics and Legislations Course (second year-second semester):

I- Pharmacy history:

1. Introduction to medicine origin.
2. Medicine in Mesopotamia.
3. Medicine of ancient Egyptians
4. Medicine of Hebrews.
5. Medicine of ancient Chinese.

6. Medicine of ancient Indians.
7. Medicine and pharmacy in Persia.
8. Mythological medicine in Greece:
 - a. Philosophical medicine.
 - b. Experimental medicine.
9. Medicine of Roman.
10. Effect of Christian religion on medicine.
11. Medicine in the pre-Islamic era.
12. Medicine in the beginning of Islamic era.
13. Medicine in the Umayyad era.
14. Translation of medical sciences into Latin.

II. Ethics and Legislations of pharmacy:

1. Legislative Decree controlling the profession of pharmacy and medical materials trade.
2. Laws and conventions related to drug trade.
3. Identification of the profession of pharmacy and pharmacist's responsibilities.
4. Terms of practicing the profession and related decrees.
5. The pharmaceutical industry and the laws governing them.
6. Pharmacists Syndicate.
7. Behavioral duties of pharmacist.

E. Applied Pharmacognosy Course (fourth year- second semester):

Class Section Topics:

1. Origins of treatment by medical plants.
2. Plant medicinal preparations:
 - 2.1. Preparation.
 - 2.2. Plant medicines.

- 2.3. Treatment.
- 2.4. Treatment by volatile oils.
- 2.5. Medical species.
3. Drugs used in treatment and protection of neurological diseases.
4. Drugs used in treatment and protection of cardiovascular diseases.
5. Drugs used in treatment and protection of respiratory system diseases.
6. Drugs used in treatment and protection of digestive system diseases.
7. Drugs used in treatment and protection of urinary tract diseases.
8. Drugs used in treatment and protection of dermal and rheumatoid diseases.
9. Drugs used in disease resistance stimulation.
10. Natural products assays.

Lab Section Topics:

1. Macroscopic examination of drugs.
2. Microscopic examination of drugs.
3. Active principles separation and extraction from their preparations.
4. Examples for detection and assay of glycosides:
 - 4.1. Saboninic.
 - 4.2. Flvonoidic.
 - 4.3. Phenolic.
 - 4.4. Latex
 - 4.5. Polysaccharide.
5. Examples for detection and assays of alkaloids.
6. Examples for detection of volatile oil cheating, assays and determining their components.

Details of External Courses

A. Arabic Language Course (first year-first semester):

1. General section:
 - 1.1.Common mistakes.
 - 1.2.Scientific terminology.
 - 1.3.Dictionary.
 - 1.4.Two reading texts in scientific terminology and dictionary.
2. Grammatical chapters:
 - 2.1. Verb-like particles.
 - 2.2. Interrogation.
 - 2.3. Solicitation, caution and Jurisdiction.
 - 2.4. Praise and Dispraise verbs.
 - 2.5. Incomplete verbs.
 - 2.6. Exclamation.
 - 2.7. Number and its metonymy.
 - 2.8. Subject and the subject of the passive.
 - 2.9. Swearing phrase.
 - 2.10. Predicate and subject of the sentence.
 - 2.11. Vocative.
 - 2.12. Negating
3. Special section index:
 - 3.1. Medical literature.
 - 3.2. Medicine in Arabic tradition.
 - 3.3. Medical educational selections.
 - 3.4. Medical dictionaries and unifying the medical terms.

B. Mathematics Course (first year- first semester):

1. Analysis:
 - 1.1.Unlimited integration.
 - 1.2.Limited integration.
2. Statistics :
 - 2.1.Frequent distributions and their graphics.
 - 2.2.Relative and accumulated frequent distributions.
 - 2.3.Standards of central inclination.
 - 2.4.Dispersion standards.
3. Probabilities:
 - 3.1.Random variables.
 - 3.2.Dual distribution.
 - 3.3.Poisson distribution.
 - 3.4.Normal distribution.
 - 3.5.Inspection distribution.
 - 3.6.Valuation theory.
 - 3.7.Theories test.
 - 3.8.Inspection distribution in the case of small samples.
 - 3.9.Kai square distribution.
 - 3.10.Simple linear decline and connection.

C. Physics Course (first year- second semester):

Class Section Topics:

The light and its nature: dualism Dobry.

The light has two natures: the first is wavelike nature, and the other is quantitative nature.

1. Light wavelike nature:

- 1.1. Simple harmonic waves.
- 1.2. Refractive index and the light pathway.
- 1.3. The passage of a light pulse through a prism.
- 1.4. Stable waves.
2. Physical nature of stable waves:
 1. Photoelectric effect, photoelectric cell and effort function.
 2. Compton effect and light scattering.
 3. Light quantitative theory.
 4. X-rays: its properties, generation and benefits.
3. Atomic structure and spectral series of Hydrogen atom:
 - 3.1. Atomic spectra.
 - 3.2. Bohr model in atomic circular orbits (S) control.
 - 3.3. Atom's energy in quantitative point of view: Rydberg constant.
 - 3.4. Spectral series of Hydrogen atom.
 - 3.5. Lyman's series.
 - 3.6. Balmer's series.
 - 3.7. Paschen's series.
 - 3.8. Brackett's series.
 - 3.9. Pfund's series.
 - 3.10. Hydrogen isotopes spectra and their Rydberg constants.
4.
 - 4.1. Molecular spectra.
 - 4.2. Infrared spectra of dissimilar diatomic molecules.
 - 4.3. Permanent and induced dipolar torques.
 - 4.4. Similar diatomic particles, Raman spectra.
 - 4.5. Inertia torques of dissimilar atomic chemical molecules, chemical .bonds' lengths
 - 4.6. Oscillatory spectrum, oscillatory motion frequency of diatomic .molecule, constant of chemical bond flexibility, chemical bond stretch

4.7. Laser beam.

- a. Generation.
- b. Lasers types: - solid laser: sapphire laser.
- Gas laser: Ne, He and CO₂ lasers.

5.

5.1. Thermodynamic:

- a. Basic concepts.
- b. Mechanical work.
- c. Temperature.
- d. The thermodynamic first law.
- e. The enthalpy.

5.2. Formulas of the first and second laws in thermodynamic:

- a. The entropy.
- b. Thermal machines.
- c. The ideal gas entropy.

5.3. Thermodynamic mathematical formulas:

- a. Total differentiations and state functions.
- b. The main relationships of variant composition PVT systems properties.
- c. Thermal capacity relationships of steady composition PVT systems.
- d. Achieving equilibrium in closed heterogenous systems.

Lab Section Topics;

1. Harmonic vibration.
2. Thermoelectric effect.
3. Joule's concept.
4. Alternative current.
5. Specific density.

6. Ohm's laws.
7. Potential splitter scale.
8. Prism scale.
9. Microscope.
10. Telephoto lenses.
11. Concave mirror.
12. Refractive indexes.
13. Ice melting point.
14. Specific heat.
15. Wheatstone bridge.
16. Simple pendulum.
17. Cathode oscilloscope .

D. Socialist National Culture Course (first year – second semester):

1. Islamic Arab civilization, Arab Nation Unity and Arabic Nationality.
2. Palestinian affair and the Arab-Zionist conflict.
3. Arab Baath Socialist party.
4. Corrective movement and National struggle.
5. Arab National Security.
6. International Variables.
7. Development and modernization in the speech of President Bashar Al-Assad.

E. Pathology Course (Second Year- Second Semester):

1. Introduction:
 - Vital signs.
 - Diseases transmission methods.
 - Definitions.

2. Septic diseases.
3. Cardiovascular system diseases.
4. Urinary tract and kidneys diseases.
5. Hematological diseases.
6. Respiratory system diseases.
7. Digestive system diseases.
8. Diabetes.
9. Thyroid diseases.
10. Growth retardation.

F. First Aid Course (fifth year-second semester):

1. Definition and causes.
2. Cardiac arrest and resuscitation.
3. Closed abdominal trauma.
4. Abdominal injuries.
5. Fractures.
6. Burns.
7. Poisoning.
8. Stings.
9. Surgical abdomen.
10. Acute pancreatitis.
11. Acute arterial occlusion.
12. Peptic ulcer complications.
13. Pulmonary embolism.

