

# FACULTY OF PHARMACY (FP)

## DOCTOR OF PHARMACY (PRACTICING DOCTORATE)

### Main Language of Instruction:

French  English  Arabic

### Campus Where the Program Is Offered: CSM

### **OBJECTIVES**

The Faculty aims to train health professionals specializing in medications and health products. It provides a strong academic and scientific foundation that helps students succeed and excel in this multidisciplinary field. This program prepares students for all aspects of professional practice, applying scientific knowledge with integrity and professionalism. It focuses on developing competent specialists who contribute positively to society, emphasizing ethics and respect for human values.

Through a diverse program, students will receive a comprehensive education that allows them to specialize in various fields, including community pharmacy, industry, hospital and clinical pharmacy, medical analysis laboratories, pharmaceutical marketing, and biological and pharmaceutical research.

In addition to lectures and seminars, this program includes practical work sessions and internships in different sectors, such as experimental pharmacy, community pharmacy, hospitals, medical laboratories, industry, and research teams. This approach aims to deepen students' scientific, medical, and pharmaceutical knowledge while developing the practical skills necessary for effective application in their future careers.

### **PROGRAM LEARNING OUTCOMES (COMPETENCIES)**

C1- Provide pharmaceutical care within a pharmacy and dispense medications and health products.

C2- Manage a pharmacy.

C3- Provide pharmaceutical care within a hospital.

C4- Contribute to the development of pharmaceutical products (production, marketing, quality control).

C5- Ensure compliance with laws in both public and private sectors (Ministry of Public Health, State Employees Cooperative, National Social Security Fund, insurance companies, etc.).

C6- Act with ethics and professionalism.

C7- Participate in the advancement of research in pharmaceutical fields, innovation, and entrepreneurship.

C8- Engage in health promotion.

### **PROGRAM REQUIREMENTS**

**360 credits: Required courses (300 credits), Institution's elective courses (15 credits), Open elective courses (10 credits), and USJ General Education Program (35 credits).**

#### **Fundamental Courses (315 Cr.)**

##### **Required Courses (300 Cr.)**

Regulatory and Industrial Affairs (2 Cr). Human Anatomy and Physiology II (4 Cr). Human Anatomy and Physiology I (5 Cr). Practical Approaches in Pharmacy (2 Cr). Quality Assurance of Health Products (3 Cr). Foundations of Healthy Nutrition (2 Cr). Clinical Biochemistry (3 Cr). Metabolic Biochemistry (4 Cr). Structural Biochemistry (3 Cr). Cell Biology + Practical Work (3 Cr). General Biology (3 Cr). Molecular Biology + Practical Work (4 Cr). Biopharmacy (2 Cr). Biophysics + Practical Work (3 Cr). Biostatistics (2 Cr). Medical Biotechnology (2 Cr). Analytical Chemistry (4 Cr). General Chemistry (3 Cr). Heterocyclic Organic Chemistry (3 Cr). Inorganic Chemistry + Practical Work (2 Cr). Organic Chemistry II (4 Cr). Organic Chemistry I (3 Cr). Therapeutic Chemistry II (2 Cr). Therapeutic Chemistry I (3 Cr). Communication I (2 Cr). Communication and Research Methodology (3 Cr). Endocrinology (2 Cr). Integrated Teaching II (2 Cr). Integrated Teaching I (1 Cr). Entrepreneurship in Pharmacy (2 Cr). Genetics (3 Cr). Management and Accounting (2 Cr). Hematology + Pathology + Practical Work (4 Cr). Hydrology (1 Cr). Hygiene (2 Cr). Immunology + Pathology + Practical Work (4 Cr). Introduction to Occupational Therapy (2 Cr). Introduction to Pharmacy Internship I-II (5 Cr). Drugs Interactions (2 Cr). Introduction to Pharmacy (3 Cr). Introduction to Market Access (2 Cr). Introduction to Food (2 Cr). Pharmaceutical Legislation (2 Cr). Microbial World (3 Cr). Marketing (2 Cr). Dissertation/Thesis (8 Cr). Special Microbiology II (4 Cr). Special Microbiology I + Practical Work (2 Cr). Medical Law (2 Cr). Pharmaceutical Ethics (2 Cr). Botanic + Practical Work (4 Cr). Genomics and Medical

Applications (2 Cr). Article Reading and Analysis I (2 Cr). Article Reading and Analysis II (2 Cr). Mechanisms of Toxicity, Carcinogenesis, and Regulation (2 Cr). Molecular Pharmacology and Biostatistics (2 Cr). Orthopedics and Medical Device Orthotics (2 Cr). Nutrition (3 Cr). Parasitology - Mycology + Practical Work (4 Cr). Personal Skills (2 Cr). Clinical Pharmacy I (3 Cr). Clinical Pharmacy II (3 Cr). Clinical Pharmacy AD I (3 Cr). Clinical Pharmacy AD II (3 Cr). Experimental Pharmacy + Validation I (5 Cr). Experimental Pharmacy + Validation II (5 Cr). Experimental Pharmacy + Validation III (5 Cr). Pharmaceutics III (4 Cr). Pharmaceutics II (4 Cr). Pharmaceutics I (2 Cr). Pharmacokinetics (4 Cr). Pharmacognosy (4 Cr). General Pharmacology (4 Cr). Special Pharmacology (4 Cr). Special Pharmacology I (4 Cr). Special Pharmacology II + Oncology (4 Cr). Physics (3 Cr). Phytotherapy and Aromatherapy (2 Cr). Public Health (2 Cr). First Aid (2 Cr). Pathological Semiology (4 Cr). Dental Care (2 Cr). Clinical Biology Internship + Report + Validation (6 Cr). Hospital Internship (11 Cr). Pharmacy Internship III, Pharmacy Follow-up, and Report (6 Cr). Pharmacy Internship II, Pharmacy Follow-up, and Report (6 Cr). Pharmacy Internship I, Pharmacy Follow-up, and Report (6 Cr). Pharmacy or Industrial Internship (1 Cr). Integrated Syntheses (3 Cr). Care Techniques (2 Cr). Toxicology (4 Cr). Emergency Toxicology (3 Cr). Biochemistry Practical Work (1 Cr). Analytical Chemistry Practical Work (2 Cr). Organic Chemistry Practical Work (2 Cr). Special Microbiology Practical Work (1 Cr). Pharmaceutics Practical Work + Integrated Syntheses Practical Work (1 Cr). Industrial Pharmacy Practical Work (1 Cr). Special Pharmacology Practical Work (1 Cr). Toxicology Practical Work (1 Cr). Virology (2 Cr).

**Institution's Elective Courses (15 Cr.), to be chosen from the list below:**

Risk Assurance Elements (2 Cr). Advanced Dietetics and Nutrition (2 Cr). Health Economics (2 Cr). Over the Counter Medication (OTC) (2 Cr). Cellular and Integrated Pharmacology in Neurosciences and Infectiology (2 Cr). Cell Signaling, Therapeutic Targets in Metabolic, Cardiovascular, and Immunotoxicology Disorders (2 Cr). Research Internship (Biochemistry, Molecular Biology, Microbiology, Pharmacology, Toxicology) (4 Cr). Internship in Pharmaceutical Firms or Industries (4 Cr). Sales Techniques (2 Cr). Innovative Therapies: From Patent to Commercialization (2 Cr). Clinical and Experimental Toxicology (2 Cr).

**Open Elective Courses (10 Cr.)**

**USJ General Education Program (35 Cr.)**

Code	Course Name	Credits
<b>ENGLISH OR OTHER LANGUAGE</b>		
004AGI3I3	English	4
<b>ARABIC</b>		
<i>Arabic Language and Culture</i>		2
435LALML2	Arabic Language and Media	2
<i>Other Course Taught in Arabic</i>		2
004LÉGSS5	Social Legislation	2
<b>HUMANITIES</b>		
064VALEL1	USJ Values in Daily Life	2
<i>Ethics</i>		3
018EPFPL2	Professional Ethics in Pharmacy	3
<i>Civic Engagement and Citizenship</i>		2
004LCADS1	Addictive Behaviors and Dependencies	2
<i>Other Humanities Course</i>		2
004PSYCI4	Psychology	2
<b>SOCIAL SCIENCES</b>		
<i>Professional Integration and/or Entrepreneurship</i>		2
004WORNS6	Work Ready Now	2
<i>Other Social Sciences Courses</i>		4

004SOLOI2	Health Sociology	2
004EVENI2	Creativity in Sustainable Development	2
	<b>COMMUNICATION TECHNIQUES</b>	<b>6</b>
004EXPCI1	Communication Skills	3
004COMMS5	Communication II	3
	<b>QUANTITATIVE TECHNIQUES</b>	<b>6</b>
004MASTI1	Mathematics and Statistics	4
004FONII2	Computer Science	2

### **SUGGESTED STUDY PLAN**

#### **Semester 1**

<b>Code</b>	<b>Course Name</b>	<b>Credits</b>
004BIOLI1	Cell Biology + Practical Work	3
004CHGEI1	General Chemistry	3
004CHIOI1	Inorganic Chemistry + Practical Work	2
004COMEI1	Communication and Research Methodology	3
004GÉNÉI1	Genetics	3
004SANEI2	Hygiene	2
435LALML2	Arabic Language and Media	2
004MASTI1	Mathematics and Statistics	4
004PHIII1	Physics	3
004EXPCI1	Communication skills	3
	Open Elective Course	2
	<b>Total</b>	<b>30</b>

#### **Semester 2**

<b>Code</b>	<b>Course Name</b>	<b>Credits</b>
004ANPHI2	Human Anatomy and Physiology I	5
004BALSI2	Foundations of Healthy Nutrition	2
004BLGEI1	General Biology	3
004CHIII2	Organic Chemistry I	3
004FONII2	Computer Science	2
004NOMPI2	Introduction to Pharmacy	3
008PSKLL3	Personal Skills	2
004SOLOI2	Health Sociology	2
004REGVI2	Botanic + Practical Work	4
004EVENI2	Creativity in Sustainable Development	2
004LADAI2	Article Reading and Analysis I	2
	<b>Total</b>	<b>30</b>

### Summer Trimester I

Code	Course Name	Credits
004PEVAL2	Practical Approaches in Pharmacy	2
004INSP12	Introduction to Pharmacy Internship I-II	5
004SOFRI2	Pharmacy Internship I, Pharmacy Follow-up, and Report	6
004SOPRI4	Dental Care	2
	<b>Total</b>	<b>15</b>

### Semester 3

Code	Course Name	Credits
004ANHUI3	Human Anatomy and Physiology II	4
004AGI3I3	English	4
004MOLBI3	Molecular Biology + Practical Work	4
004BIPHI3	Biophysics + Practical Work	3
004CANAI3	Analytical Chemistry	4
004CHORI3	Organic Chemistry II	4
004LEMI3I3	Microbial World	3
004PACII3	Pharmacokinetics	4
	<b>Total</b>	<b>30</b>

### Semester 4

Code	Course Name	Credits
004QLTEI4	Quality Assurance of Health Products	3
004CEORI4	Heterocyclic Organic Chemistry	3
004IALII4	Introduction to Food	2
004PHQEI4	Pharmaceutics I	2
004PSYCI4	Psychology	2
004HYSAI4	Public Health	2
004CHTP14	Organic Chemistry Practical Work	2
004TPCAI4	Analytical Chemistry Practical Work	2
004BIOMI2	Structural Biochemistry	3
064VALEL1	USJ Values in Daily Life	2
018EPFPL2	Professional Ethics in Pharmacy	3
004TEVEI4 or 004ELASI4	Institution's Elective Courses: Sales Techniques or Risk Assurance Elements	2
	Open Elective Course	2
	<b>Total</b>	<b>30</b>

## Summer Trimester II

Code	Course Name	Credits
494INERL3	Introduction to Occupational Therapy	2
004PHEVI4	Experimental Pharmacy + Validation I	5
004SUOFI4	Pharmacy Internship II, Pharmacy Follow-up, and Report	6
005TSPHL2	Care Techniques	2
	<b>Total</b>	<b>15</b>

## Semester 5

Code	Course Name	Credits
004BTSQS1	Biostatistics	2
004BITHS1	Medical Biotechnology	2
004HÉMAS1	Hematology + Pathology + Practical Work	4
004MSPES1	Special Microbiology I + Practical Work	2
004PAMYS1	Parasitology - Mycology + Practical Work	4
004PAGAS1	Pharmaceutics II	4
004PHAMS1	General Pharmacology	4
004SEPAS1	Pathological Semiology	4
004SYINS1	Pharmaceutics Practical Work + Integrated Syntheses Practical Work	1
004LCADS1	Addictive Behaviors and Dependencies	2
004DIONS2 or 004UVESS1	Institution's Elective Course Advanced Dietetics and Nutrition or Health Economics	2
	Open Elective Course	2
	<b>Total</b>	<b>33</b>

## Semester 6

Code	Course Name	Credits
004BIOMS2	Metabolic Biochemistry	4
004BORIS2	Biopharmacy	2
004CHITS2	Therapeutic Chemistry I	3
004ENINS2	Integrated Teaching I	1
004HYDOS2	Hydrology	1
004IPEAS2	Immunology + Pathology + Practical Work	4
004PHMES2	Pharmacognosy	4
004PHLES2	Special Pharmacology	4
004TPBIS2	Biochemistry Practical Work	1
004IELES2	Industrial Pharmacy Practical Work	1
004UVPSCS1	Institution's Elective Course Over the Counter Medication (OTC)	2
	<b>Total</b>	<b>27</b>

### Summer Trimester III

Code	Course Name	Credits
004COMUS2	Communication I	2
004IMACS2	Introduction to Market Access	2
004PHEXS2	Experimental Pharmacy + Validation II	5
004SUIOS2	Pharmacy Internship III, Pharmacy Follow-up, and Report	6
<b>Total</b>		<b>15</b>

### Semester 7

Code	Course Name	Credits
004SBLGS3	Clinical Biochemistry	3
004CHT3S3	Therapeutic Chemistry II	2
004ETPHS3	Entrepreneurship in Pharmacy	2
004MIBOS3	Special Microbiology II	4
004PHAGS3	Pharmaceutics III	4
004PECLS3	Clinical Pharmacy I	3
004PHSOS4	Special Pharmacology II + Oncology	4
004SECOS3	First Aid	2
004TOXIS3	Toxicology	4
004TPMIS3	Special Microbiology Practical Work	1
004TOXXS4	Toxicology Practical Work	1
	Open Elective Course	2
<b>Total</b>		<b>32</b>

### Semester 8

Code	Course Name	Credits
004ENLOS4	Endocrinology	2
004ENITS4	Integrated Teaching II	2
004INTES4	Drugs Interactions	2
004NUTRS4	Nutrition	3
004TEQES4	Clinical Pharmacy II	3
004PHSPS3	Special Pharmacology I	4
004PHYTS4	Phytotherapy and Aromatherapy	2
004TODUS4	Emergency Toxicology	3
004PHAPS3	Special Pharmacology Practical Work	1
004VIROS4	Virology	2
004GEAMM1	Genomics and Medical Applications	2
004MATCM1	Mechanisms of Toxicity, Carcinogenesis, and Regulation	2
004PHMBM1	Molecular Pharmacology and Biostatistics	2
<b>Total</b>		<b>30</b>

#### Summer Trimester IV

Code	Course Name	Credits
004PAEXS4	Experimental Pharmacy + Validation III	5
004STBCS4	Clinical Biology Internship + Report + Validation	6
004SCCTM1	<u>Institution's Elective Courses</u> <b>Choose two of the following courses:</b> Cell Signaling, Therapeutic Targets in Metabolic, Cardiovascular, and Immunotoxicology Disorders (2 Cr.)	8
	Innovative Therapies: From Patent to Commercialization (2 Cr.)	
	Clinical and Experimental Toxicology (2 Cr.)	
	Cellular and Integrated Pharmacology in Neurosciences and Infectiology (2 Cr.)	
	<b>Choose one of the following courses:</b> Research Internship (Biochemistry, Molecular Biology, Microbiology, Pharmacology, Toxicology) (4 Cr.)	
	Internship in Pharmaceutical Firms or Industries (4 Cr.)	
<b>Total</b>		<b>19</b>

#### Semester 9

Code	Course Name	Credits
004COMES5	Regulatory and Industrial Affairs	2
004COMMS5	Communication II	3
004GESTS5	Management and Accounting	2
004LEPHS5	Pharmaceutical Legislation	2
004LÉGSS5	Social Legislation	2
004MARKS5	Marketing	2
004PHACS5	Clinical Pharmacy AD I	3
004PHCCS6	Clinical Pharmacy AD II	3
004DRMES5	Medical Law	2
004HIQMS5	Pharmaceutical Ethics	2
004LADAS5	Article Reading and Analysis II	2
004WORNS6	Work Ready Now	2
	Open Elective Course	2
<b>Total</b>		<b>29</b>

#### Semester 10

Code	Course Name	Credits
004MMOIS6	Dissertation/Thesis	8
004STAHS6	Hospital Internship	11
004STAGS6	Pharmacy or Industrial Internship + Validation	1
004SYNIS5	Integrated Syntheses	3
004OTMES5	Orthopedics and Medical Device Orthotics	2
<b>Total</b>		<b>25</b>

## COURSE DESCRIPTION

<b>004COMES5</b>	<b>Regulatory and Industrial Affairs</b>	<b>2 Cr.</b>
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Part 1: This course consists of the following:

Quality in the Pharmacy – Educational Objectives:

- Reinforce the fundamental principles of the community pharmacy profession for future pharmacists and introduce them to new pharmacy activities.
- Equip students with initial training in quality assurance in the pharmacy and best practices, particularly in dispensing healthcare products.

Acquired Competencies:

By the end of this course, students will be able to:

- Implement a quality assurance approach in the pharmacy, from reception to dispensing and providing advice.
- Generate and implement documentation related to quality assurance in the pharmacy.
- Evaluate the quality of pharmaceutical practice.

This part provides a foundation for training as a community pharmacist. It requires prior knowledge of quality assurance taught in the second year and prepares students for professional practice while adhering to regulatory obligations for quality assurance of pharmaceutical products and services. This part also develops competencies in initiating and evaluating a quality assurance system in the pharmacy.

Part 2: Regulatory Affairs – Course Objectives:

- Understand the basics of quality.
- Understand the fundamentals of regulatory affairs.
- Comprehend standards, standardization bodies, and good manufacturing and distribution practices.
- Understand the regulatory framework.
- Apply this knowledge practically in production and distribution.

<b>004ANHUI3</b>	<b>Human Anatomy and Physiology II</b>	<b>4 Cr.</b>
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This course provides students with a solid understanding of the human body, offering a foundational knowledge of the relationship between structure and function, essential for careers in health sciences.

- Anatomy: The study of the body's structure and how its parts are interconnected.
- Physiology: The functioning of the body's systems to sustain life. Relevant clinical cases are introduced to highlight normal body functions.

Competency Framework:

Assess the patient's pharmacological and biological condition.

Assess the patient's medical history, lab tests, and diagnostic results.

This course aims to understand the body as a dynamic system of interrelated parts, rather than isolated units.

<b>004ANPHI2</b>	<b>Human Anatomy and Physiology I</b>	<b>5 Cr.</b>
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This course provides students with a solid understanding of the human body, offering a foundational knowledge of the relationship between structure and function, essential for careers in health sciences.

- Anatomy: The study of the body's structure and how its parts are interconnected.
- Physiology: The functioning of the body's systems to sustain life. Relevant clinical cases are introduced to highlight normal body functions.

Competency Framework:

- Assess the patient's pharmacological and biological condition.
- Assess the patient's medical history, lab tests, and diagnostic results.
- This course aims to understand the body as a dynamic system of interrelated parts, rather than isolated units.

<b>004AGI3I3</b>	<b>English</b>	<b>4 Cr.</b>
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This course aims to develop students' proficiency in written and spoken English, enabling them to:

- Communicate effectively with diverse audiences.
- Present information clearly and accurately in writing, using language and style suited to the content and target audience.
- Deliver oral presentations confidently, using appropriate verbal and nonverbal communication, as well as relevant visual aids and supporting materials.

**004PEVAl2      Practical Approaches in Pharmacy      2 Cr.**

This course provides hands-on training in practical pharmacy techniques, helping students develop essential skills for their internships.

**004QLTEI4      Quality Assurance of Health Products      3 Cr.**

This course serves as a foundation for training as a pharmacist. It requires no prerequisites and aims to familiarize students with the vocabulary used in the field of quality while introducing them to quality assurance in pharmaceutical production and services. It contributes to the development of the following competencies:

- Understand the concepts of quality and the quality approach in pharmacy.
- Explain the principles of quality management, including ISO standards and pharmaceutical references.
- Assess the effectiveness of various approaches implemented to ensure the traceability of healthcare products.

By the end of this course, students will be able to:

- Evaluate active substances and select the technical means for formulating medications.
- Assess the performance of developed medications in vitro and in vivo.

**004BALS12      Foundations of Healthy Nutrition      2 Cr.**

This course covers introductory concepts related to nutritional sciences and food.

**004SBLGS3      Clinical Biochemistry      3 Cr.**

This course enables students to:

- Evaluate biochemical and pathophysiological parameters, homeostasis, and the regulatory mechanisms of carbohydrate, lipid, and protein metabolism, as well as liver and kidney functions, and electrolyte and phosphocalcium balance, including blood gases.
- Recognize the biochemical parameters of a healthy individual, and physiological variations for the aforementioned functions, as well as biochemical abnormalities.
- Select and apply biochemical assay methods, identify interferences, evaluate markers, particularly tumor and cardiac markers, interpret results, identify associated pathological disorders, and provide clinical-biological advice to enhance diagnostic and preventive management.
- Master major pathologies, their risk factors, and methods of biochemical, biological, and molecular diagnosis, including disorders of carbohydrate, lipid, and protein metabolism, cancer, cardiac, liver, kidney diseases, electrolyte and phosphocalcium imbalances, uric acid disorders, and blood gases.

**004BIOMS2      Metabolic Biochemistry      4 Cr.**

This course consists of two main parts. The first part covers enzymology, analyzing the mechanisms of enzyme function in biology, identifying suitable kinetic models, understanding inhibitions and activations, and their applications in pharmacy and metabolic biochemistry. The second part explores catabolic and anabolic reactions within major metabolic pathways (carbohydrates, lipids, amino acids, nucleic acids). It details the energy balance of essential metabolic pathways for humans, regulatory mechanisms, and homeostasis, along with their pathophysiological implications. This course also enables students to recognize key inborn errors of metabolism and major metabolic diseases and their causes.

**004BIOMI2      Structural Biochemistry      3 Cr.**

This course describes organic constituents and explains anabolism, catabolism, transformation reactions, and changes during pathological conditions. It consists of five chapters, following an introductory section that covers carbohydrates, lipids, proteins, and nucleic acids.

The first chapter introduces biochemistry and emphasizes its connection to physiology, pathology, and medicine. It reviews key concepts related to chemical elements, reactions, and chemical bonds, highlighting the importance of chemical groups in the functioning of biological molecules.

The second chapter focuses on carbohydrates, exploring their structural representations, isomerism, derived molecules, and biological roles.

The third chapter examines lipids, concentrating on fatty acids, triglycerides, phospholipids, glycosphingolipids, steroids, and vitamins. It also provides an overview of bioactive lipids, their derivatives, and their significance as pharmaceutical targets.

The fourth chapter studies proteins, starting with the structure of the twenty amino acids that make up proteins, followed by peptides and their structures, and finally the primary, secondary, tertiary, and quaternary structures of proteins. It also discusses amino acid-derived molecules and their relevance as pharmaceutical targets. The fifth and final chapter addresses the structure of nucleic acids (DNA and RNA), their biological roles, and their properties.

**004BIOI1 Cell Biology + Practical Work****3 Cr.**

This course covers the study of cells, which are essential to living biological systems, in nine chapters. The first chapter introduces the main classes of biological macromolecules: carbohydrates, lipids, proteins, and nucleic acids. The second chapter examines the similarities and differences among various cell types (eukaryotic, prokaryotic, and non-nucleated). The third chapter delves into cell membranes. The fourth chapter discusses the organization of the extracellular matrix. The fifth chapter explores the nucleus of the eukaryotic cell, the cell cycle, and the molecular regulatory mechanisms governing it. The sixth chapter focuses on the intracellular membrane network, including the smooth and rough endoplasmic reticulum, Golgi apparatus, lysosomes, and vacuoles. The seventh chapter investigates the cytoskeleton, covering microtubules, microfilaments, and intermediate filaments. The eighth chapter explores the ability of mitochondria and chloroplasts to convert energy from one form to another, as well as the role of peroxisomes as oxidative organelles. The ninth chapter examines apoptosis by studying the intracellular and extracellular pathways of programmed cell death.

**004BLGEI1 General Biology****3 Cr.**

This course covers comparative anatomy in vertebrates, reproduction, fertilization, and embryology, providing general concepts related to the living world. Its aim is to familiarize students with fundamental notions in general biology, particularly in animal biology and developmental biology.

**004MOLBI3 Molecular Biology + Practical Work****4 Cr.**

This course introduces students to the fundamentals of molecular biology, covering genetic information transmission, DNA, replication, transcription, translation, variations, mutation mechanisms, and their implications in pathologies. It addresses the tools used for gene exploration and various methods for studying these variations and genetic diagnostics, ranging from classical methods to next-generation sequencing. This course is a prerequisite for medical and pharmaceutical biotechnology.

**004BORIS2 Biopharmacy****2 Cr.**

This course serves as a foundation for pharmacy education and requires essential prerequisites in human anatomy and physiology, general chemistry, pharmacokinetics, pharmaceutical formulation, and mathematics and statistics. It contributes to the development of the following skills:

- Determining and utilizing the physicochemical and biological characteristics of active substances in drug development.
- Selecting the appropriate pharmaceutical form and technology for each active principle.
- By the end of this course, students will be able to:
- Evaluate active substances and choose the technical means to formulate them into medications.
- Assess the performance of the developed drug in vitro and in vivo.

**004BIPHI3 Biophysics + Practical Work****3 Cr.**

The course complements the “Physics” course by applying physical principles and laws to interpret and explain biological phenomena occurring in the human body, which is essential for students in medical sciences. It covers:

- The electrolytic properties of aqueous ionic solutions and their applications in iontophoresis.
- The concepts of acid-base balance in the human body, including buffer systems, regulation, and disorders.

- The fundamentals of the interaction between electromagnetic radiation and matter, including dosimetry and radiotherapy.

Practical work demonstrates these concepts.

<b>004BTQS1</b>	<b>Biostatistics</b>	<b>2 Cr.</b>
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The biostatistics course enables students to:

- Understand the primary statistical methods for analyzing clinical data.
- Learn the principles of clinical and pharmacoepidemiological intervention studies.
- Utilize IBM SPSS for standard statistical analyses of data.
- Critically evaluate the statistical methodology and study protocols in scientific articles.

<b>004BITHS1</b>	<b>Medical Biotechnology</b>	<b>2 Cr.</b>
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This course covers advanced knowledge in genetic engineering and biotechnology, focusing on pharmaceutical applications and therapeutic innovations in the field, including:

- Gene therapy
- Recombinant proteins and molecular cloning
- Drug synthesis processes via genetic engineering
- Biosimilars and regulations
- Gene-drug interactions
- New therapeutic strategies based on innovative pharmaceutical biotechnologies.

<b>004CANAI3</b>	<b>Analytical Chemistry</b>	<b>4 Cr.</b>
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This course equips students with essential theoretical concepts for the functional analysis of major classes of biomolecules and pharmaceutical active substances while deepening their understanding of the most commonly used spectroscopic methodologies in the laboratory. Numerous applications are presented. By the end of this course, students will be able to:

- Mobilize theoretical concepts in chemistry and the structure-property relationship to design an experimental method for drug analysis.
- Extract maximum information regarding the physicochemical properties and predictable chemical behavior of organic molecules through an informed reading of the corresponding formulas and structures.
- Apply acquired knowledge in chemistry to major classes of pharmacological molecules.
- Understand chromatographic methods and applications.
- Characterize organic compounds structurally using complementary information from MS, NMR, and IR analyses.

<b>004CHGEI1</b>	<b>General Chemistry</b>	<b>3 Cr.</b>
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This course enables students to establish the essential chemical foundation necessary for future studies while fostering critical and scientific thinking. The initial chapters help students consolidate their knowledge regarding the study of matter composed of atoms and the bonds present within them. Subsequently, the focus shifts to chemical reactions and equilibria, allowing students to grasp the fundamental principles of chemistry.

<b>004CEORI4</b>	<b>Heterocyclic Organic Chemistry</b>	<b>3 Cr.</b>
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This course provides an in-depth study of reaction mechanisms and their applications in the organic synthesis of heterocyclic compounds. It includes studies of retrosynthetic analysis and the synthesis of bioactive molecules, highlighting the issues of chemoselectivity and regioselectivity encountered. The overall goal is to develop reasoning based on the molecular structure of active ingredients. By the end of this course, students will be able to:

- Predict and explain the expected outcomes of the main types of reactions of carbonyl derivatives, linking them to their mechanisms.
- Name heterocyclic compounds.
- Perform retrosynthetic analysis.
- Establish and master classical and modern methods for synthesizing common nitrogenous, oxygenous, and sulfurous aromatic heterocycles.
- Apply these methods in the total synthesis of bioactive molecules.

**004CHIOI1****Inorganic Chemistry + Practical Work****2 Cr.**

This course introduces the organometallic chemistry of transition metals. It covers the theories of chemical bond formation in inorganic compounds, as well as the fundamental concepts of coordination chemistry from the perspective of structure, physicochemical properties, and reactivity. Practical application of these theoretical concepts occurs during laboratory sessions, where students will learn to use laboratory equipment and instruments and will document their experimental results in writing.

By the end of this course, students will be able to:

- Identify and analyze the mechanisms of action of inorganic complexes and chelating agents that play a significant role in pharmacology.
- Recognize the essential properties in descriptive chemistry of elements.
- Analyze current issues (environmental chemistry, catalysis, bioinorganic chemistry, therapeutic chemistry).
- Apply safety guidelines in a chemistry laboratory.
- Perform volumetric titration in solution.
- Understand the principles of and perform spectrophotometric analysis.

**004CHORI3****Organic Chemistry II****4 Cr.**

This course complements the previous instruction on the fundamental principles of organic chemistry. It focuses on and further develops the reactions (nomenclature, formulas, chemical properties, mechanisms, synthesis, and pharmaceutical roles) of carbonyl compounds, carboxylic acids and their derivatives, amines, and aromatic compounds. This course also covers the various protective groups for organic functions and the different types of reactions (oxidation and reduction) necessary for obtaining a specific molecule.

By the end of this course, students will be able to identify and master the functional groups in organic chemistry, as well as a range of concepts, principles, and methods from fundamental sciences. This knowledge not only enhances the critical and scientific thinking of future pharmacists but also assists them in their practical laboratory work.

**004CHII12****Organic Chemistry I****3 Cr.**

The course introduces the fundamental concepts of structure, nomenclature, stereochemistry, and reaction mechanisms, providing students with a sufficient mastery of the corresponding terminology. Additionally, it aims to integrate these concepts into the explanation of reaction mechanisms in organic chemistry and the study of various elimination and substitution reactions.

**004CHT3S3****Therapeutic Chemistry II****2 Cr.**

This course aims to understand, consolidate, and expand knowledge across all therapeutic classes, focusing on:

- Molecular structure.
- Physicochemical properties and their implications for formulation, kinetics, and metabolism.
- Structural adaptations that influence interactions with receptors and enzymes.
- Analogies among various structures and their physiological, metabolic, kinetic, and pharmacological consequences.
- Development opportunities arising from these structures and innovative molecular design approaches.
- Synthetic pathways to access these molecules.

**004CHITS2****Therapeutic Chemistry I****3 Cr.**

This course covers:

- Molecular structure.
- Physicochemical properties and their implications for formulation, kinetics, and metabolism.
- Structural properties affecting receptor and enzyme interactions.
- Analogies among structures and their therapeutic implications.
- Development opportunities and innovative molecular design.
- Synthetic pathways for accessing these molecules.

**004COMMS5      Communication II      3 Cr.**

This course introduces students to professional career development. By the end of this course, they will be able to:

- Understand human resources (HR) policies.
- Comprehend the evolution of HR management.
- Utilize HR management tools effectively.
- Recognize their role as transformation leaders.
- Conduct a realistic assessment of necessary leadership skills.
- Identify and define their personal leadership style.
- Foster collaboration within their future teams.
- Enhance their leadership performance.
- Understand themselves better as leaders.
- Position themselves according to their dominant leadership style.
- Cultivate the qualities of a motivated and motivating leader.
- Manage their emotions and those of others effectively.

**004COMUS2      Communication I      2 Cr.**

This course examines interpersonal communication as a key element of effective relationships. It emphasizes that while communication is part of daily life, it requires awareness and skill to avoid misunderstandings, tension, or stress that may hinder collaboration. The course explores the principles of effective communication, cooperation, and coexistence, focusing on active listening, understanding others, managing emotions, message clarity, and adaptability. Students will identify their communication styles and their organization's strengths and areas for improvement and will acquire the tools to build trust and rapport for successful professional and personal relationships.

**004COMEI1      Communication and Research Methodology      3 Cr.**

By the end of this course, students will be able to:

- Identify principles and applications of various microscopes.
- Recognize different types of X-ray-based medical imaging.
- Explain principles and applications of MRI, ultrasound, and echodoppler.
- Determine principles and applications of nuclear medicine for diagnostics and therapeutics.
- Describe flow cytometry principles and analyze results.
- Recognize principles of cell culture.
- Understand the western blot technique.
- Describe production and applications of monoclonal antibodies in diagnostics and therapeutics.

**004ENLOS4      Endocrinology      2 Cr.**

This course covers the study of hormones, metabolism, hormonal dysfunctions, and regulation of secretions.

**004ENITS4      Integrated Teaching II      2 Cr.**

This course integrates various resources to enhance learning in pharmacology, clinical pharmacy, therapeutic chemistry, and pharmaceutics, fostering interaction among these fields. It establishes interaction between pharmacology, clinical pharmacy, therapeutic chemistry, and pharmaceutics.

**004ENINS2      Integrated Teaching I      1 Cr.**

This course introduces integrated teaching methods that allow students to access all resources contributing to improved learning in pharmacology, clinical pharmacy, therapeutic chemistry, and galenic pharmacy.

**004ETPHS3      Entrepreneurship in Pharmacy      2 Cr.**

This course guides students through the entrepreneurial journey, focusing on the essential steps to develop a business project in the health innovation sector. It covers key topics such as:

- Essential qualities and skills of successful entrepreneurs
- Steps involved in developing a startup

- Startup financing options and strategies
- Business model development
- Market research and analysis
- Go-to-market planning and execution
- Effective pitching techniques for investors

**018EPFPL2 Professional Ethics in Pharmacy**

**3 Cr.**

This course explores the challenges of living in a world where references and values are fragmented, and norms are relative to individual beliefs. It addresses common questions that resonate with everyone: What actions can truly promote humanization for oneself and others? How can one lead a good, happy, and responsible life?

**004GÉNÉI11 Genetics**

**3 Cr.**

This course explores clinical genetics and its significance in medical practice.

It begins with the molecular foundations of genetics, defining key terms and discussing the transfer of genetic information from DNA to protein, alongside the impact of nucleotide variations on human diseases.

This course then examines various genetic disorders, focusing on chromosomal and monogenic diseases. A major component involves analyzing family pedigrees to illustrate Mendelian inheritance patterns, including autosomal dominant, autosomal recessive, and X-linked inheritance.

Students will explore genetic diseases from molecular and clinical perspectives, covering transmission concepts like penetrance, expressivity, de novo mutations, mosaicism, and consanguinity, along with cancer genetics and population genetics.

**004GESTS5 Management and Accounting**

**2 Cr.**

This course presents the essential characteristics, objectives, economic roles, and structure of businesses. It aims to help students understand the fundamentals of accounting as a management tool, become familiar with banking and financial instruments, learn about different business structures, and comprehend the purchasing and sales system.

**004HÉMAS1 Hematology + Pathology + Practical Work**

**4 Cr.**

This course contributes to developing competencies in studying blood components and applying theoretical knowledge in hematology within a medical biology laboratory.

**004HYDOS2 Hydrology**

**1 Cr.**

This course enhances students' knowledge of public health concerning water, emphasizing transmissible diseases and necessary individual and community measures.

**004SANEI2 Hygiene**

**2 Cr.**

This course aims to:

- Familiarize students with the principles, practices, and hygiene rules essential for preserving and improving health.
- Explain how to implement hygiene measures according to specific protocols across various applications, including the hygiene of premises, equipment, individual hygiene, and food hygiene, to prevent transmissible diseases in communities and combat contamination sources.

**004IPEAS2 Immunology + Pathology + Practical Work**

**4 Cr.**

This course studies the foundations of physiological and pathological humoral and cellular immunity, including diagnostic methods.

**004FONII2 Computer Science**

**2 Cr.**

This course contributes to the development of the following competencies:

- Provide pharmaceutical care within a pharmacy and dispense medications and health products.
- Manage a pharmacy.

- Provide pharmaceutical care in a hospital setting.
- Contribute to the development of pharmaceutical products (production, marketing, quality control).
- Participate in research development in the pharmaceutical field, innovation, and entrepreneurship.

This course contributes to the development of the following learning outcomes:

- Interpret requested biological results and participate in patient orientation.
- Manage the pharmacy.
- Ensure the follow-up of pharmaceutical care and its documentation.
- Inform, promote, and respond to health professionals' inquiries within marketing and regulatory affairs teams.
- Apply knowledge, information-seeking skills, and professional judgment in decision-making processes.
- Collaborate in the development of fundamental and applied research in pharmaceutical, biological, and health fields.

**494INERL3      Introduction to Occupational Therapy**

**2 Cr.**

This course familiarizes students with common health issues faced by communities and their consequences. It is structured around practical workshops where students will engage in dynamic and playful scenarios. This approach encourages future pharmacists to reflect on the dimensions of individuals, their environments, and their activities to understand the interactions and impacts on quality of life. Real-life simulations and field visits will provide students with the opportunity to learn and apply various methods for assisting these individuals.

**004INSP12      Introduction to Pharmacy Internship I-II**

**5 Cr.**

This introductory internship aims to familiarize students with pharmacy practice by providing an initial experience in a pharmacy setting. The internship provides an initial immersion in the professional environment, allowing students to discover the daily activities of a pharmacy and observe and comment on the various roles of a pharmacist in a retail pharmacy, such as dispensing, advising, managing, regulating, and handling customer and patient relations. The internship also provides examples to help students learn the practical approach they need to adopt to achieve its objectives.

**004INTES4      Drugs Interactions**

**2 Cr.**

This course provides a foundation for pharmacy training and is part of the Bachelor and Master programs. By the end of this course, students will be able to:

- Analyze a prescription, identify, and describe potential interactions.
- Assess interactions and determine their severity.
- Inform patients about possible drug interactions.
- Explain to patients the measures to take to avoid interactions.

**004NOMPI2      Introduction to Pharmacy**

**3 Cr.**

This course covers pharmacy professions basics:

Prepare and dispense medications and health products. Ensure that prescriptions are properly validated. Identify the active ingredients, their main and secondary indications, and any dosage errors or potential interactions. Thoroughly explain to patients how to use medications and ensure that they have accepted and understood their treatment. Inform the patient of any major side effects, toxic effects, precautions for use, and follow-up. Ensure that all activities are in accordance with the established pharmacovigilance regulations, thereby promoting safety and compliance. Prepare officinal and magistral preparations according to the established protocols. Dispensing and providing advice on over-the-counter products, parapharmacy products, medical equipment, and orthopedics are key parts of this role.

It is essential to understand the legal framework that governs the practice of pharmacy. This includes the following aspects:

- The process of granting licenses to individuals to practice as pharmacists.
- The issuance of licenses for the operation of pharmacies or pharmaceutical warehouses.
- The establishment and operation of drug manufacturing facilities.
- The importation of narcotics.
- The determination of the sale price of pharmaceutical products.

**004IMACS2      Introduction to Market Access      2 Cr.**

This course enables pharmacy students to:

- Understand how the pharmaceutical industry works and the journey of a drug, from R&D to market launch.
- Analyze healthcare systems on a global scale, with a particular focus on Lebanon, and identify stakeholders and their roles.
- Discover strategic functions within the pharmaceutical industry.
- Understand the role of Market Access in corporate strategies, both globally and locally.
- Develop skills for interacting with healthcare systems, understanding payers' expectations, and building relevant value propositions.
- Understand pharmacoconomics and different types of economic evaluations.
- Apply drug pricing strategies, access models, and contracting mechanisms.
- Negotiate and communicate effectively with healthcare system stakeholders.

**004IALII4      Introduction to Food      2 Cr.**

This course provides an approach to nutrients through basic foods, dishes, and common meals.

**004LEPHS5      Pharmaceutical Legislation      2 Cr.**

This course is aimed at pharmacy students to clarify the primary purpose of the profession: protecting patient health. It emphasizes several key principles: the pharmacist operates as an independent professional and is subject to regulations that define practice conditions to ensure patient and medication safety.

This course highlights the professional culture of pharmacists, who view medications as healthcare products, patients as individuals requiring care, and themselves as the only experts on medications. This perspective contrasts sharply with a mercantilist approach that treats health as a business, viewing medications as consumer goods, patients as customers, and pharmacists as mere salespeople.

**435LALML2      Arabic Language and Media      2 Cr.**

This course provides students with an engaging and flexible way to explore the Arabic language and its rich culture. It offers insights into the use of Arabic in various forms of media, including visual, audio, and written journalism, as well as in advertisements across these formats. Through this course, students will develop practical linguistic skills in both oral and written communication, enhancing their proficiency and appreciation of the language.

**004LÉGSS5      Social Legislation      2 Cr.**

This course aims to:

- Familiarize students with the administrative structure of the National Social Security Fund, including the Board of Directors, Technical Committee, and General Secretariat.
- Learn the steps and areas of application, including the various branches and the subjects involved.
- Explain the different benefits provided by the National Social Security Fund, such as health and maternity insurance, workplace accidents and occupational diseases, family and school benefits, and end-of-service indemnities.

**004LEMII3      Microbial World      3 Cr.**

This course introduces students to the microbial world and develops the following competencies:

- Recognizing the various mechanisms of bacterial, viral, parasitic, and fungal infections.
- Identifying cross-infections relevant to pharmacists and the most prevalent infections worldwide.
- Acquiring the necessary knowledge and prerequisites for the special microbiology course.

**004MARKS5      Marketing      2 Cr.**

This course enables students to:

- Understand the purpose of pharmaceutical logistics and marketing.
- Learn the organization and functioning of the pharmaceutical industry.
- Acquire the fundamentals of pharmaceutical marketing and its various management styles.

<b>004MASTI1</b>	<b>Mathematics and Statistics</b>	<b>4 Cr.</b>
This course provides essential mathematical and statistical foundations for students in medical sciences, equipping them to understand the mathematical formulations encountered during their studies and subsequent research. The teaching approach includes:		
<ol style="list-style-type: none"> <li>1. An in-depth exploration of mathematical functions used in medical sciences, such as logarithms, exponentials, and hyperbolic functions, along with a study of phenomena like bacterial growth, hyperglycemia tests, and drug elimination.</li> <li>2. Fundamental concepts in statistics and biostatistics, offering healthcare specialists the general knowledge needed to effectively tackle survey problems and statistical testing.</li> </ol>		
<b>004MMOIS6</b> <b>Dissertation/Thesis</b> <b>8 Cr.</b>		
This course involves conducting a bibliographic work with or without practical application on a topic related to pharmaceutical studies.		
<b>004MIBOS3</b>	<b>Special Microbiology II</b>	<b>4 Cr.</b>
This course introduces infectious pathologies of bacterial origin in humans, whether strictly human or zoonotic. It contributes to the development of the following competencies:		
<ul style="list-style-type: none"> <li>- Identify different pathogenic bacteria in humans and recognize the clinical signs of the infections they cause.</li> <li>- Gain initial skills in identifying bacteria responsible for infections and their sensitivity to antibiotics.</li> <li>- Understand various antibiotic treatments appropriate for each infection based on factors such as location and age.</li> <li>- Acquire essential knowledge for differential diagnosis with viral infections to provide effective advice to patients in a pharmacy setting.</li> </ul>		
<b>004MSPES1</b>	<b>Special Microbiology I + Practical Work</b>	<b>2 Cr.</b>
This course describes the main pathogenic bacteria affecting humans and the fundamental aspects of infectious pathology associated with each microorganism. It contributes to the development of the following competencies:		
<ul style="list-style-type: none"> <li>- Recognizing the primary bacteria involved in human pathology (Gram-positive and Gram-negative cocci), their diagnosis, and treatment.</li> <li>- Identifying the bacteria responsible for infections in humans.</li> </ul>		
Practical work complements the theoretical and oral instruction provided. This course supports the competency of applying knowledge in bacteriology within a medical biology laboratory and enhances the theoretical and oral teachings received during practical sessions. The practical training is not intended to transform students into bacteriologists; rather, it aims to provide an overview of conventional bacteriological diagnostic methods.		
By the end of this course, students will be able to:		
<ul style="list-style-type: none"> <li>- Perform basic microbiology techniques, including direct examination and Gram staining, culture on solid and liquid media, and slide agglutination tests.</li> <li>- Use biochemical identification galleries and biochemical tests for bacterial identification.</li> <li>- Conduct an antibiogram through diffusion on agar medium, interpret results, and select effective antibiotics for treating infections.</li> </ul>		
<b>004LADAS5</b>	<b>Article Reading and Analysis II</b>	<b>2 Cr.</b>
By the end of this course, students will be able to:		
<ul style="list-style-type: none"> <li>- Recognize the various stages required for establishing a research project and publication.</li> <li>- Utilize the main bibliographic data search engines (e.g., PubMed, Em-premium, clinical trials).</li> <li>- Understand the methodology of epidemiological studies and identify their different types.</li> <li>- Analyze figures from original scientific articles and scientific reviews.</li> <li>- Formulate a research hypothesis and support it with relevant bibliographic references.</li> <li>- Draft and/or evaluate a brochure for a new medication.</li> </ul>		

<b>004EVENI2</b>	<b>Creativity in Sustainable Development</b>	<b>2 Cr.</b>
This course explores how to optimize the balance between the environmental challenges of an event and its effectiveness. It covers key concepts in event management and provides strategies for integrating sustainable practices into event planning and execution.		
<b>004DIONS2</b>	<b>Advanced Dietetics and Nutrition</b>	<b>2 Cr.</b>
This course aims to deepen students' understanding of nutrition and its relationship with chronic diseases. Each chapter introduces essential concepts, focusing on the benefits and drawbacks of specific food components. Students will learn how to manage various diets throughout different life stages and their connections to chronic health issues.		
<b>004UVESS1</b>	<b>Health Economics</b>	<b>2 Cr.</b>
This course allows students to deepen their foundational knowledge in chosen disciplines, gradually preparing them for specialized professional practice.		
<b>004ELASI4</b>	<b>Risk Assurance Elements</b>	<b>2 Cr.</b>
This course introduces key concepts of insurance.		
<b>004GEAMM1</b>	<b>Genomics and Medical Applications</b>	<b>2 Cr.</b>
By the end of this course, students will be able to: 1. Identify different genome sequencing methods. 2. Apply exome, genome, and genetic analyses in medicine and pharmacy. 3. Integrate gene expression analysis and quantification techniques for research and diagnostics. 4. Understand transgenic animal models and their applications in gene studies or therapeutic target research.		
<b>004LADAI2</b>	<b>Article Reading and Analysis I</b>	<b>2 Cr.</b>
By the end of this course, students will be able to: - Recognize the key steps required for setting up a research project and/or publication. - Use primary search engines for bibliographic data (Pubmed, Em-Premium, Scopus). - Understand the methodology of epidemiological studies and identify their various types. - Analyze figures in original scientific articles and review papers.		
<b>004MATCM1</b>	<b>Mechanisms of Toxicity, Carcinogenesis, and Regulation</b>	<b>2 Cr.</b>
This course provides an in-depth understanding of clinical and experimental toxicology. By the end of this course, students will be able to: - Describe the fate of toxins in the body (toxicokinetics, biotransformations, cellular and molecular toxic mechanisms). - Apply the principles of cell culture. - Identify the various toxicity studies and tests required for new drug marketing authorization. - Determine the basis of carcinogenesis, mutagenesis, teratogenesis, and immunotoxicity. - Recognize the fundamentals of pharmacovigilance. - Apply the principles of scientific article analysis.		
<b>004UVPCS1</b>	<b>Over the Counter Medication (OTC)</b>	<b>2 Cr.</b>
This elective course allows students to deepen their foundational knowledge in chosen disciplines while gradually preparing them for a specific professional practice. By the end of this course, students will be able to: - Identify key pathologies encountered in the pharmacy, understand the algorithm for managing them with OTC treatments, and recognize cases to refer to a physician, including the role of each molecule. - Provide the best possible advice to patients.		

**004PCINM1      Cellular and Integrated Pharmacology in Neurosciences and Infectiology      2 Cr.**

This course introduces research in neuropharmacology through cellular and integrated pharmacology in neuroscience and infectiology. It provides students with the latest approaches to studying common neurological disorders and developing new treatments. The course is divided into five parts for each disorder, covering the causes of diseases and current treatments, strategies for drug targeting and biomarker identification, presentation of treatment options under investigation, and detailed explanations of animal models and evaluation tests used in preclinical studies.

**004PHMBM1      Molecular Pharmacology and Biostatistics      2 Cr.**

This course enables students to:

1. Recall key statistical methods for clinical data analysis.
2. Understand principles of clinical intervention and pharmacoepidemiological studies.
3. Critique statistical methodologies in scientific articles.
4. Analyze survival data.
5. Understand regression models.
6. Grasp principles of systematic reviews and meta-analysis.
7. Build a database for statistical analysis (e.g., dissertation).
8. Use IBM SPSS for standard statistical analyses.

**004OTMES5      Orthopedics and Medical Device Orthotics      2 Cr.**

This course in orthopedics focuses on diagnosing, treating, and preventing disorders and injuries of the musculoskeletal system, including bones, joints, muscles, tendons, and ligaments. Students will understand how muscles and bones work together, study the structure and function of the musculoskeletal system, learn to diagnose conditions such as fractures, dislocations, sprains, tendinitis, and osteoarthritis, and explore treatment options including medications, physical therapy, braces, and assistive devices.

**004STPHM1      Internship in Pharmaceutical Firms or Industries      4 Cr.**

Students who have completed their fourth year may undertake an optional, two-week-minimum industrial pharmacy internship at a Lebanese pharmaceutical company or firm approved by the faculty.

This internship primarily serves to introduce pharmacy interns to the various departments of the pharmaceutical industry, such as sales, marketing, market access, production, and regulatory affairs, depending on the company. At the end of the internship, interns must submit a report that develops the theoretical aspects and provides one to two practical examples from their internship experience.

**004STDEM1      Research Internship (Biochemistry, Molecular Biology, Microbiology, Pharmacology, Toxicology)      4 Cr.**

This course introduces fundamental and clinical research in the fields of clinical biochemistry, genetics, molecular biology, microbiology, pharmacology, and toxicology.

By the end of the course, students will be able to:

- Integrate fundamental research developments in pharmaceutical and biological fields.
- Use molecular biology and genetics techniques (DNA extraction, PCR, electrophoretic migration, sequencing, etc.).
- Learn about cell culture methods.
- Process cell stimulation and recognize techniques for evaluating target gene expression (RNA extraction, PCR, real-time PCR, electrophoretic migration, etc.).
- Use analytical separation techniques (GC-MS).
- Use bioinformatics software and explore various genetic databases and sequence analysis software.
- Prepare a poster or present research results.
- Apply microbiology techniques, particularly molecular microbiology and microbiota analysis.
- Learn methods for mutation research, sequencing, and pharmacogenetics.

<b>004SCCTM1</b>	<b>Cell Signaling, Therapeutic Targets in Metabolic, Cardiovascular, and Immunotoxicology Disorders</b>	<b>2 Cr.</b>
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By the end of this course, students will be able to:

- Recognize different cellular signaling pathways, their physiopathological and therapeutic applications, chemical messengers, receptors, and signaling pathway modules and their regulation.
- Master the molecular, cellular, diagnostic, and therapeutic approaches to major metabolic and cardiovascular pathologies, as well as the latest advances in research on diabetes, dyslipidemias, hypercholesterolemia, and cardiovascular complications, and in nutrigenetics and nutrigenomics.
- Describe the different types of cell death.
- Recognize the signaling pathways activated by xenobiotics.
- Identify adverse effects induced by monoclonal antibodies and tyrosine kinase inhibitors.
- Recognize the fundamentals of animal experimentation.
- Explain the basis of toxicogenomics.
- Integrate the development of fundamental research in the pharmaceutical and biological domains.

<b>004TEVEI4</b>	<b>Sales Techniques</b>	<b>2 Cr.</b>
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This course is designed to prepare students for their first professional experience, which often involves sales-related activities. It provides hands-on field skills and practical techniques used in the business world. The course trains students in the latest sales methods and develops their sense of professionalism to make the transition into sales within a company both productive and enjoyable. Students will acquire essential skills that will remain valuable throughout their careers.

<b>004TIBCM1</b>	<b>Innovative Therapies: From Patent to Commercialization</b>	<b>2 Cr.</b>
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This course provides a deep understanding of pharmaceutical law and regulations at the international, regional, and local levels. This includes the stages of research and development, pre-launch, and product launch. It covers the stages of research and development, pre-launch, and product launch, and includes both theoretical training and practical experience through an internship. Students will gain insight into the functioning of the pharmaceutical industry, the essential role of pharmacists, and the wide range of career opportunities available in the sector.

<b>004TCEXM1</b>	<b>Clinical and Experimental Toxicology</b>	<b>2 Cr.</b>
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This course provides an in-depth understanding of clinical and experimental toxicology. By the end of this course, students will be able to describe the toxic effects of:

- Toxic agents affecting the liver.
- Toxic agents affecting the kidneys.
- Toxic substances on the central nervous system (CNS).
- Mycotoxins.
- Phytoxins.
- Pesticides.

<b>004WORNS6</b>	<b>Work Ready Now</b>	<b>2 Cr.</b>
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This course helps students develop self-confidence, open-mindedness, and adaptability to change. It also prepares them for the professional world by guiding them in writing a cover letter and resume and developing leadership skills.

<b>004DRMES5</b>	<b>Medical Law</b>	<b>2 Cr.</b>
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This course enables students to:

- Understand the fundamental principles of civil rights, including extrapatrimonial, patrimonial, real accessory, personal, and intellectual rights.
- Learn the sources of obligations.
- Gain insight into employment contracts.

<b>004HIQMS5</b>	<b>Pharmaceutical Ethics</b>	<b>2 Cr.</b>
This course encourages students to reflect on aspects of pharmaceutical practice related to professional confidentiality and patient information. It aims to:		
<ul style="list-style-type: none"> <li>- Explore the foundations of the healing art.</li> <li>- Understand key concepts in contemporary moral philosophy, particularly in applied ethics and bioethics.</li> <li>- Examine the Universal Declaration of Human Rights (1948).</li> </ul>		
<b>004LCADS1</b>	<b>Addictive Behaviors and Dependencies</b>	<b>2 Cr.</b>
This course addresses the increasing issue of substance abuse among youth. By the end of this course, students will be able to:		
<ul style="list-style-type: none"> <li>- Identify the mechanisms involved in pharmacological dependence on psychoactive substances.</li> <li>- Recognize the toxic effects induced by major drugs, including cannabis, opioids, cocaine, amphetamines, and GHB.</li> <li>- Report the experiences of specialized physicians (psychiatrists, emergency doctors) and representatives from NGOs focused on drug management and addiction prevention in Lebanon.</li> </ul>		
<b>004REGVI2</b>	<b>Botanic + Practical Work</b>	<b>4 Cr.</b>
This course consists of lectures and practical work, enabling students to understand the taxonomic, structural, and morphological diversity of plants and fungi, as well as their ecology and developmental cycles.		
<b>004SOLOI2</b>	<b>Health Sociology</b>	<b>2 Cr.</b>
This course provides a sociological exploration of the connections between health, illness, and society. It aims to understand how social, cultural, economic, and institutional factors affect health practices, disease-related inequalities, care behaviors, and patients' lived experiences. For future pharmacists, this course provides a broader understanding of their role in the healthcare system beyond a strictly biomedical approach.		
<b>004NUTRS4</b>	<b>Nutrition</b>	<b>3 Cr.</b>
This course introduces nutrition, defining key concepts, the nutritional status of individuals, and human nutritional behavior. It covers fundamental nutrition principles and addresses obesity and its therapeutic approaches.		
<b>004PAMYS1</b>	<b>Parasitology - Mycology + Practical Work</b>	<b>4 Cr.</b>
This course enables students to deepen their understanding of the diagnostic approach in parasitology, mycology, and medical entomology.		
<b>008PSKLL3</b>	<b>Personal Skills</b>	<b>2 Cr.</b>
This course equips students with the essential skills for today's workforce, while cultivating leadership qualities. It streamlines the transition from academia to the professional world by focusing on practical applications of theoretical concepts and enhancing the learning experience through role-playing and case studies.		
<b>004PECLS3</b>	<b>Clinical Pharmacy I</b>	<b>3 Cr.</b>
This course equips students with the essential knowledge to understand major pathologies, their complications, and the biological tests for diagnosis and monitoring. It enables students to actively participate in therapeutic decision-making and select optimal treatments, including treatment selection, dosage adjustments, dosage form choices, and understanding precautions, contraindications, and potential side effects.		
<b>004TEQES4</b>	<b>Clinical Pharmacy II</b>	<b>3 Cr.</b>
This course helps students deepen their knowledge and assess their understanding of infectiology and neurology. It focuses on improving patient management, monitoring, and optimizing pharmaceutical care plans.		

**004PHACS5 Clinical Pharmacy AD I 3 Cr.**

This course equips students with essential knowledge in various clinical areas, including oncology, pulmonology, gastroenterology, dermatology, allergology, ophthalmology, and nephrology. Students will learn about international treatment guidelines and will be able to evaluate pharmacotherapy regarding appropriate treatments, potential side effects, strategies to minimize them, possible drug interactions, and dosage adjustments. This course aims to establish a Pharmaceutical Care Plan (PCP) for individual patients in both hospital and community settings, emphasizing that the pharmacist's approach should remain consistent regardless of the environment. This course also aims to ensure the provision of high-quality pharmaceutical care within a hospital setting.

**004PHCCS6 Clinical Pharmacy AD II 3 Cr.**

This course is designed for fifth-year pharmacy students who have preferably completed pharmacology in their third year and clinical pharmacy in their fourth year. Students will conduct their hospital clinical internship, focusing on optimizing the care of patients with conditions encountered during their placements. This course enhances students' knowledge primarily in cardiology and rheumatology, enabling them to analyze the best possible patient care, follow-up, and optimization of the pharmaceutical care plan.

By the end of this course, students will be able to:

- Recognize key aspects of cardiac and rheumatic pathologies and understand the overall management algorithm.
- Explain the role of each medication class discussed within the therapeutic arsenal and identify the specific position of each drug within the same class.
- Provide effective advice to patients.

**004PHEVI4 Experimental Pharmacy + Validation I 5 Cr.**

This course provides students with practical pharmacy training in real-life settings, enabling them to offer accurate pharmaceutical advice to patients effectively.

**004PHEXS2 Experimental Pharmacy + Validation II 5 Cr.**

This course involves practical pharmacy training, where students engage in real-life scenarios to learn how to provide accurate pharmaceutical advice to patients and analyze prescriptions. It is part of the Experimental Pharmacy III program and includes validation.

**004PAEXS4 Experimental Pharmacy + Validation III 5 Cr.**

This course places students in real-life situations to provide accurate pharmaceutical advice to patients and analyze prescriptions. These simulation exercises enhance the acquisition of essential skills.

**004PHAGS3 Pharmaceutics III 4 Cr.**

This course focuses on innovative pharmaceutical forms and those under development for various routes of administration, including biologic medications.

Program Learning Outcomes:

- Collaborate within a team to develop a pharmaceutical product.
- Participate in the manufacturing of a pharmaceutical product.
- Ensure quality control of pharmaceutical products according to established standards.
- Inform, promote, and address inquiries from healthcare professionals within marketing and regulatory affairs teams.

**004PAGAS1 Pharmaceutics II 4 Cr.**

This course enables students to understand and perform pharmaceutical operations, recognize and identify pharmaceutical forms, formulate, manufacture, and control them, and provide guidance on their administration. Students will define quality standards for each form, identify defective drugs, and recognize and identify packaging items.

**004PHQE14      Pharmaceutics I      2 Cr.**

This course focuses on the key packaging articles and excipients used in pharmaceutical forms.

Program Learning Outcomes:

- Develop a pharmaceutical product as part of a team.
- Participate in the manufacturing of a pharmaceutical product.
- Ensure quality control of pharmaceutical products according to standards.
- Inform, promote, and address inquiries from healthcare professionals within marketing and regulatory affairs teams.

**004PACII3      Pharmacokinetics      4 Cr.**

This course serves as a foundation for pharmacist training and is required for second-year pharmacy Bachelor and Master students.

By the end of this course, students will be able to:

- Interpret how drugs behave in the body.
- Analyze pharmacokinetic phases (ADME).
- Identify and calculate key pharmacokinetic parameters.
- Recommend suitable drug administration routes and forms for patients.
- Develop optimal therapeutic regimens and dosages (including dose and frequency).

**004PHMES2      Pharmacognosy      4 Cr.**

This course focuses on studying natural raw materials for medical use, including their botanical characteristics, chemical properties, physiological activities, therapeutic applications, and control methods. It also covers the monographs of carbohydrate drugs, lipid plants, essential oil plants, and alkaloids.

**004PHAMS1      General Pharmacology      4 Cr.**

This course provides students with essential knowledge in pharmacokinetics and pharmacodynamics through three main parts:

- The first part covers the pharmacological development of drugs, including the stages of experimental and clinical research.
- The second part focuses on pharmacokinetics, explaining the four key phases: absorption, distribution, biotransformation, and elimination.
- The third part examines pharmacodynamics, including drug receptors, mechanisms of action, drug interactions, and variations in sensitivity.

The course involves lectures and practical sessions.

**004PHLES2      Special Pharmacology      4 Cr.**

This course provides students with key knowledge about mediators, receptors, and transporters in the central nervous system and gastroenterology. Understanding these concepts enables students to anticipate therapeutic effects and side effects of medications, allowing them to create tailored care programs in pharmacies and hospitals. This foundational knowledge is essential for succeeding in future clinical pharmacy courses, focusing on delivering pharmaceutical care effectively.

Program Learning Outcomes (PLO)

This course supports PLO 1.2: Addressing patient needs for pharmaceutical care, which involves:

- Listening to patient concerns.
- Gathering relevant information about the patient's condition.
- Analyzing the situation's severity:
- Emergency: Provide first aid and refer to a hospital.
- Beyond competence: Refer to a healthcare professional.
- Within competence: Manage the situation, dispense medications, and give appropriate advice.

Course Learning Outcomes (CLO)

The special pharmacology course consists of two modules:

Neuropharmacology Module:

- Autonomic nervous system (sympathetic and parasympathetic)

- Dopaminergic system (Parkinson's disease, psychoses, treatments)
- Serotonergic system (depression, migraines, treatments)
- GABAergic system (epilepsy, anxiety disorders, treatments)

#### Gastroenterology Module:

- Ulcers and reflux treatments
- Constipation and laxatives
- Diarrhea and anti-diarrheals
- Irritable bowel syndrome management

### 004PHSPS3      Special Pharmacology I

4 Cr.

This course explores the hormonal and endocrine systems, emphasizing the function of antibiotics, their practical indications, and potential patient issues.

By the end of this course, students will be able to:

- Explain the main mechanisms of action of the medications studied.
- Identify potential adverse effects of the drug classes covered.
- Understand the implications of side effects and methods to avoid them.
- Define the therapeutic indications for the drug families discussed.

### 004PHSOS4      Special Pharmacology II + Oncology

4 Cr.

This course covers the mediators, receptors, transporters, and targets involved in cancer and anticancer treatments. Understanding the expected therapeutic effects and potential side effects enables students to develop tailored care and advice programs, particularly in oncology. This course is essential for preparing students for the subsequent clinical pharmacy course in their fifth year and for their practical clinical internship at the hospital. This course aims to provide pharmaceutical care within a hospital or pharmacy setting by dispensing medications and health products.

### 004PHIII1      Physics

3 Cr.

This course covers the study of mechanics, electricity, fluid mechanics, vibrational phenomena, optics, atomic physics, spectroscopy, and radiation (including laser, X-rays, UV, IR, and NMR) with applications in the medical field. It is designed for first-year pharmacy students and is part of the required Bachelor program. It contributes to the development of competencies and program learning outcomes (PLO), specifically:

Provide pharmaceutical care within a pharmacy by dispensing medications and health products.

Interpret requested biological results and participate in patient orientation, including:

- Understanding different types of samples
- Grasping the fundamentals of basic biology
- Comprehending the basics of clinical biology
- Knowing the physiological and pathological values of common markers
- Familiarity with methods for analyzing biological media
- Understanding the basic analyses conducted in a clinical biology laboratory during internships.

### 004PHYTS4      Phytotherapy and Aromatherapy

2 Cr.

This course enables students to:

- Define phytotherapy and explain its relationship to other medical and pharmaceutical disciplines, covering its history, evolution, and essential concepts such as active ingredients, synergy of action, totum, and traditional and modern pharmaceutical forms.
- Understand medicinal plants, including their origins, active components, therapeutic properties, methods of use, side effects, potential drug interactions, and usage guidelines. This knowledge will be applied to provide effective pharmaceutical care for patients with various health conditions.

### 004PSYCI4      Psychology

2 Cr.

This course introduces the fundamentals of psychology and its applications in health psychology. It aims to:

- Understand the interplay between biological and psychological factors.
- Explore how thoughts, behaviors, and emotions function.

- Acquire foundational concepts in health psychology to enhance public health education.
- Learn how to approach patients based on psychological health theories.

**004HYSAI4      Public Health      2 Cr.**

This course explores public health education, the recommendations of the WHO, and the issues of environment and pollution.

**004SECOS3      First Aid      2 Cr.**

This course covers the history and organization of the Red Cross, focusing on emergency care and appropriate responses to various situations.

**004SEPAS1      Pathological Semiology      4 Cr.**

This course includes:

- Discussion of major medical syndromes
- Detailed clinical aspects and complications
- Therapeutics and practical pharmacology of diseases
- Emphasis on clinical signs, medical semiology, and physical examination
- A focus on synthesis in course delivery

**004SOPRI4      Dental Care      2 Cr.**

This course expands students' understanding of hygiene and dental care, equipping them to offer informed pharmaceutical advice.

**004STBCS4      Clinical Biology Internship + Report + Validation      6 Cr.**

This internship provides students with hands-on experience in clinical biology, familiarizing them with various biological tests and their interpretation in clinical laboratories.

**004STAHS6      Hospital Internship      11 Cr.**

This course consists of rotations in various hospital departments and the hospital pharmacy, tailored for fifth-year Doctor of Pharmacy students. It spans two semesters of the academic year, running concurrently with a theoretical course in Clinical Pharmacy taught by pharmacists and medical specialists.

Students will complete their clinical internship at the *Hôtel-Dieu de France* Medical Center and the Bellevue Medical Center, covering several departments: pharmacy, cardiology, oncology, psychiatry, infectious diseases, pediatrics, and pulmonology. Each student will select five departments at the start of the year.

This internship aims to enhance students' clinical knowledge. They will understand key pathologies and international treatment guidelines, as well as evaluate pharmacotherapy. This includes assessing treatment appropriateness, identifying potential side effects and strategies to minimize them, recognizing possible drug interactions, and adjusting dosages. Ultimately, students will develop tailored pharmaceutical care plans for individual patients within specific hospital contexts.

They will receive guidance from coordinators who monitor their activities and progress throughout the internship. The clinical internship lasts for five periods of four weeks each, totaling 20 weeks during the fifth year of pharmacy studies.

**004STAGS6      Pharmacy or Industrial Internship + Validation      1 Cr.**

This is the final part of the pharmacy internship, where students will complete their training with a month of practical synthesis in a community pharmacy.

**004SUIOS2      Pharmacy Internship III, Pharmacy Follow-up, and Report      6 Cr.**

This internship deepens students' theoretical pharmacy knowledge, enables them to apply it in practice, and familiarize them with prescription validation and pharmaceutical care.

**Objectives:**

1. Enhance knowledge of over-the-counter and prescribed medications according to the Faculty's program.
2. Organize and plan work to complete the program on time.
3. Manage therapy for a set number of patients, increasing as the internship progresses and ensuring case diversity.
4. Research information, analyze therapy, and identify goals, potential side effects, and patient-specific issues.
5. Counsel patients in a respectful manner, ensuring they understand and accept their therapy.
6. Document activities regularly for presentation to the supervisor during weekly meetings.
7. Conduct self-assessments of activities, identifying successes and areas for improvement.
8. Attend follow-up meetings at the Faculty.

**004SUOFI4      Pharmacy Internship II, Pharmacy Follow-up, and Report**

**6 Cr.**

This internship aims to strengthen students' theoretical knowledge of pharmacy, apply it in practical settings, and help them become familiar with the daily operations of a pharmacy.

**Objectives:**

1. Enhance knowledge of over-the-counter and prescribed medications according to the Faculty's program.
2. Organize and plan work to complete the program on time.
3. Manage therapy for a set number of patients, increasing as the internship progresses and ensuring case diversity.
4. Research information, analyze therapy, and identify goals, potential side effects, and patient-specific issues.
5. Counsel patients in a respectful manner, ensuring they understand and accept their therapy.
6. Document activities regularly for presentation to the supervisor during weekly meetings.
7. Conduct self-assessments of activities, identifying successes and areas for improvement.
8. Attend follow-up meetings at the Faculty.

**004SOFI12      Pharmacy Internship I, Pharmacy Follow-up, and Report**

**6 Cr.**

This course is an introductory internship that provides students with their first experience in a community pharmacy. It includes an orientation meeting before the internship and two additional meetings during the summer to discuss progress. Students will get to know the pharmacy workplace, including its legal, administrative, and organizational aspects, learn about common medications and medical supplies, observe pharmacists at work, including patient interactions, therapy analysis, counseling, and follow-up, and collaborate effectively with the team while performing assigned tasks responsibly. They will follow professional rules, maintain confidentiality, and consult reference books and resources such as the DORVAULT medical dictionary. Activities include familiarization with the internship environment, fundamental management concepts, parapharmaceutical products, baby care accessories, treatments for corns and warts, and antiseptic medications.

**004SYNIS5      Integrated Syntheses**

**3 Cr.**

This course teaches students to provide pharmaceutical care for simple and complex cases in hospitals and community settings. Students will apply their knowledge to understand clinical cases and develop treatment plans for each identified problem based on professional society guidelines, ensuring correct dosages, checking for drug interactions, and setting up methods to monitor patient progress while providing appropriate counseling. Cases focus on infectious diseases, pediatrics, cardiology, hematology, and gastroenterology, and students may work individually or in teams of seven to eight. They will consider all aspects of the patient's health, including comorbidities, overall profile, lab results, and current medications, and present their pharmaceutical interventions with scientific rigor, critical analysis, and clear documentation tailored to the patient's situation.

**005TSPHL2      Care Techniques**

**2 Cr.**

This course equips students with knowledge and skills in applying care techniques while adhering to safety and quality standards.

**004EXPCI1      Communication Skills**

**3 Cr.**

This course enhances the skills needed to effectively receive, analyze, and convey information. It focuses on mastering appropriate techniques, improving linguistic and methodological competencies, and empowering students to communicate effectively while strengthening their personal and professional image.

**004TOXIS3      Toxicology      4 Cr.**

This required course contributes to the development of the following competencies and Program Learning Outcomes (PLO):

C.1.1. Prepare and dispense medications and health products.

C.1.2. Address the needs of patients seeking pharmaceutical care for treatment or guidance.

PLO 1.1.3. Inform patients about potential toxic effects of medications.

By the end of this course, students will be able to:

- Inform patients about potential toxic effects of medications and other toxic products.

- Analyze an intoxication, assess its severity, and determine appropriate actions.

**004TODUS4      Emergency Toxicology      3 Cr.**

By the end of this course, students will be able to:

- Inform patients about potential toxic effects of medications and other toxic products.

- Analyze an intoxication, assess its severity, and determine appropriate actions.

**004TPBIS2      Biochemistry Practical Work      1 Cr.**

This practical work focuses on quantifying biomolecules and demonstrating their chemical properties. Students will synthesize, format, and present their results according to scientific standards, with each pair preparing a report.

Objectives:

- Select a method to analyze a biological sample.

- Apply biochemistry concepts to design an experimental method for biomolecule analysis.

- Familiarize with biochemical calculations and equations.

- Produce a concise report summarizing the work and results, presented in graphs or tables.

**004TPCAI4      Analytical Chemistry Practical Work      2 Cr.**

This practical work introduces the fundamental principles of qualitative and quantitative chemical analysis in aqueous solutions, utilizing acid-base, redox, precipitation, and complexation equilibria. It familiarizes students with the underlying theories of various instrumental techniques in chemistry. The experiments include NMR, MS, GC, HPLC, visible and UV spectroscopy, infrared spectrophotometry, and spectrofluorimetry. Additionally, some analytical strategies for detecting counterfeit medications are discussed.

Objectives:

- Apply theoretical concepts in chemistry and the structure-property relationship to design an experimental method for drug analysis.

- Conduct all steps involved in colorimetric volumetric titration.

- Characterize organic compounds structurally using complementary information from MS, NMR, and IR analyses.

**004CHTP14      Organic Chemistry Practical Work      2 Cr.**

These practical sessions familiarize students with modern organic synthesis techniques used to prepare small organic molecules for applications in medicinal chemistry, agrochemistry, materials science, and cosmetics. The sessions involve identifying the synthesized molecules using advanced analytical techniques such as NMR, MS, UV, IR, HPLC, GC-MS, and TLC. Students will gain experience in planning experiments, managing time, maintaining a laboratory notebook, adhering to lab safety protocols, and respecting environmental concerns. A relevant bibliographic review and an experimental report are required.

Objectives:

- Analyze experimental results to determine the mechanism or reactivity of chemical species.

- Apply theoretical concepts in chemistry and the structure-property relationship to design an experimental method for synthesizing a molecule.

- Precisely determine a molecule's structure by integrating various spectroscopic techniques and analyze an experimental fact to draw conclusions.

**004TPMIS3      Special Microbiology Practical Work      1 Cr.**

This course is offered to students enrolled in the 4<sup>th</sup> year of the Doctorate of Pharmacy (Practicing Doctorate). It aims to develop the competency of applying theoretical knowledge in bacteriology within a medical biology laboratory. The practical instruction is not intended to train students as bacteriologists but rather to provide an overview of conventional bacteriological diagnostic methods.

**Objectives:**

- Perform basic microbiology techniques: direct examination, Gram staining, and culture on solid and liquid media, along with slide agglutination tests.
- Use biochemical galleries and biochemical tests for bacterial identification.
- Conduct an antibiogram using the diffusion method in agar, interpret results, and select effective antibiotics for treating infections.

**004SYINS1      Pharmaceutics Practical Work + Integrated Syntheses Practical Work      1 Cr.**

This course combines practical work in pharmaceutics and integrated syntheses. In pharmaceutics, students will apply techniques for formulating, preparing, evaluating, and controlling pharmaceutical forms—solids, liquids, and semi-solids—while understanding and using excipients and complying with quality standards and good practices. In integrated syntheses, students will perform chemical and galenic syntheses that combine skills from chemistry, physical chemistry, formulation, and control, consolidating knowledge and developing the ability to complete a practical project from start to finish. The course provides hands-on laboratory experience, allowing students to apply their theoretical knowledge of galenical pharmacy and integrate all steps from design to evaluation.

**004IELES2      Industrial Pharmacy Practical Work      1 Cr.**

This course involves formulating a medication and simulating production in industrial manufacturing workshops while applying principles of drug control from a galenic and biopharmaceutical perspective. The practical sessions consist of rotating manipulations, where students will gain hands-on experience in drug formulation and quality control. Utilizing knowledge from galenic pharmacy and chemistry, students will adhere to good laboratory and manufacturing practices. This course is essential for understanding the formulation, manufacturing, and quality control of medications, encompassing topics such as galenic pharmacy, industrial pharmacy, pharmacokinetics, and quality assurance.

**004PHAPS3      Special Pharmacology Practical Work      1 Cr.**

This course covers tests on analgesics and muscle relaxants.

**004TOXXS4      Toxicology Practical Work      1 Cr.**

This course covers the detection of toxic substances (medications, drugs, metals, etc.) in various biological fluids or foods through practical work. It complements the Toxicology course.

**Objectives:**

- Analyze an intoxication case
- Assess its severity
- Determine appropriate measures to take

**004VIROS4      Virology      2 Cr.**

This course introduces students to viral infectious pathologies in humans, whether strictly human or zoonotic. It aims to:

- Recognize various pathogenic viruses in humans and the clinical signs of associated infections.
- Initiate diagnostic processes for viral infections.
- Identify appropriate antiviral treatments for each infection.
- Acquire essential knowledge for differential diagnosis with bacterial infections.

**064VALEL1      USJ Values in Daily Life      2 Cr.**

This course aims to raise students' awareness of the fundamental values of the Saint Joseph University of Beirut.