BACHELOR IN LIFE AND EARTH SCIENCES - BIOCHEMISTRY

Main Language of Instruction:
French ☑ English ○ Arabic ○

Campus Where The Program Is Offered: CST- CLN- CLS

OBJECTIVES

The Bachelor in Life and Earth Sciences - Biochemistry provides a versatile education that offers an in-depth understanding of the biological and chemical processes governing life, while equipping students with strong practical skills. This program goes beyond disciplinary knowledge by integrating transversal skills such as leadership, innovation, design thinking, and entrepreneurship, thus preparing students to tackle the challenges of the current and future world. It fosters the development of analytical and problem-solving abilities, strengthens scientific communication skills, promotes the integration of domain knowledge, and encourages the practical application of acquired knowledge. Additionally, it offers opportunities for advanced studies and ensures successful integration into the professional world. This undergraduate program aims to forge competent scientists and committed leaders, ready to shape the future.

PROGRAM LEARNING OUTCOMES (COMPETENCIES)

A Bachelor in Life and Earth Sciences - Biochemistry allows graduates to develop a diverse skill set applicable to a variety of fields, from laboratory research to industry, as well as education. Upon completing this program, students will be able to:

- Communicate scientific information related to Life and Earth Sciences - Biochemistry to the general public
- Demonstrate technical expertise within a laboratory setting
- Teach Life and Earth Sciences
- Pursue advanced studies in health sciences, environmental sciences, industrial sciences, agronomy, or food science
- Participate in scientific research in the field of Life and Earth Sciences - Biochemistry

PROGRAM REQUIREMENTS

180 credits: Required courses (148 credits), Institution's elective courses (26 credits), Open elective courses (6 credits).
USJ General Education Program (32 credit- part of the above categories).

USJ General Education Program (32 Cr.)
English (4 Cr.)
English Level A (4 Cr.)
Arabic (4 Cr.)
Arabic Culture and Language (2 Cr.)
Choose a course from the following options:
435LALAL2 Arabic Language and the Arts (2 Cr.)
435LALML2 Arabic Language and the Media (2 Cr.)
Arabic Course (2 Cr.)
Choose a course from the following options:
048TCSOL2Theater and Self-Discovery (2 Cr.)
048EVMOL1 Self-Expression Through Music (2 Cr.)
048GESAL4 Basic Pre-Rescue First Aid (2 Cr.)
Humanities (8 Cr.)
Ethics (2 Cr.)
Choose a course from the following options:
048ETSBL1 Ethics and Health (2 Cr.)
048ETTPL1 Ethics and Technology (2 Cr.)

048EEECL1 Ethics, Energy and Environnement (2 Cr.)
043STREL1 Society, Religion, and Ethics (2 Cr.) (at CLN)
008CETHL4 Corporate Culture and Ethics (2 Cr.) (at CLS)

Religious Studies (2 Cr.)

064VALEL1 USJ Values in Daily Life (2 Cr.)

Civic and Citizen Engagement (2 Cr.)

Choose a course from the following options:
048DVQCL1 Law in Everyday Life (2 Cr.)
048CITBL1 Active Citizenship: Strategy and Techniques (2 Cr.)
048SSDCL1 Sustainable Development (2 Cr.)
358CIACL4 Citizen and Community Action (2 Cr.) (at CLN)
015ABC2L3 Volunteer and Citizen Action (2 Cr.) (at CLS)

Other (2 Cr.)

Choose a course from the following options:
048OCSCL1 Origin of Scientific Concepts (2 Cr.)
048JSCPL1 Scientific Journalism (2 Cr.)
048MAMPL1 The World, Current Events, and Me (2 Cr.)
090MOC2F2 Mediation: An Amicable Means of Conflict Resolution (2 Cr.) (at CLN)
043HTLBL2 History of Lebanese Theater (2 Cr.) (at CLN)
358DTVEL2 Doubt and Truth: A Critical Reading of Facts (2 Cr.) (at CLN)
017CVIOF2 Non-Violent Communication (2 Cr.) (at CLS)
061FNEWL2 Fake News (2 Cr.) (at CLS)

Professional Integration and Entrepreneurship (2 Cr.)

Choose a course from the following options:
048ENTML6 Entrepreneurship (2 Cr.)
048SJHPL2 Successful Job Hunting (2 Cr.)
048WRNBL2 Work Ready Now (2 Cr.)
008ETINL5 Entrepreneurship and Innovation (2 Cr.) (at CLS)

Other (4 Cr.)

Choose a course from the following options:
048DETML6 Designing Business Models (2 Cr.)
048TMMML2 Time and Money Management (2 Cr.)
048EMIPL2 Sociology of Emotions (2 Cr.)
048LEABL2 Social Leadership (2 Cr.)
358LEECL1 Panorama of the Lebanese Economy I (2 Cr.) (at CLN)
358PLE2L2 Panorama of the Lebanese Economy II (2 Cr.) (at CLN)
043CULPL1 Political Culture (2 Cr.) (at CLN)
061WRNSL2 Work Ready Now (4 Cr.) (at CLS)

Communication Techniques (4 Cr.)

048TCOBL4 Communication Techniques (4 Cr.)

Quantitative Research Techniques (6 Cr.)

048MTHBL1 Mathematics I (2 Cr.)
048MTHBL2 Mathematics II (4 Cr.)

Fundamental Courses

Required Courses (150 Cr.)

048CSCCL1 General Chemistry I (6 Cr.); 048OGOBL1 General Organization of Organisms: From Cells to Organs (6 Cr.); 048MTHBL1 Mathematics I (2 Cr.); 048ODVBL1 Origin and Diversity of Life (6 Cr.); 048PTEBL1 Planet Earth and Environment (6 Cr.); 048DAVBL2 Development of Animal and Plant Organisms (6 Cr.); 048GEGBL2 Genes and Genomes (6 Cr.); 048AHUBL2 Human Anatomy (2 Cr.); 048MTHBL2 Mathematics II (4 Cr.); 048PPBBL2 Physics for Biologists (6 Cr.); 064VALEL1 USJ Values in Daily Life (2 Cr.); 048STOCL3 Basics of Stereochemistry and Organic Chemistry (4 Cr.); 048BMABL3 Biochemistry of Macromolecules (6 Cr.); 048EAEBL3 Ecology, Adaptation and Molecular Evolution (6 Cr.); 048GFMBL3 Fundamental and Molecular Genetics (6 Cr.); 048PRSCL3 Probability and Statistics (4 Cr.); 048GEOBL4 Applied Geology (2 Cr.); 048BITBL4 Biotechnologies (4 Cr.); 048TCOBL4

Communication Techniques (4 Cr.); 048BIFBL4 Functional Biochemistry (2 Cr.); 048EFMBL4 Fundamental and Molecular Enzymology (6 Cr.); 048PMYBL4 Parasitology and Mycology (2 Cr.); 048PVEBL4 Plant Physiology (4 Cr.); 048BCABL5 Advanced Cellular Biology (4 Cr.); 048BTABL5 Basics of Food Toxicology (4 Cr.); 048ANGLL5 English (4 Cr.); 048IMFBL5 Fundamental Immunology (6 Cr.); 048BCMBL5 Metabolic Biochemistry (6 Cr.); 048BAVBL6 Bacteriology and Virology (6 Cr.); 048BIIBL6 Bioinformatics (2 Cr.); 048BIMBL6 Molecular Biology (6 Cr.); 048PDOBL6 Organ Physiology (6 Cr.); 048PPHBL6 Paleontology, Paleoenvironments and Evolution of Hominids (4 Cr.)

Institution's Elective Courses (24 Cr.) (to choose from the following list)
048BUICL1 Advanced Document and Data Management (2 Cr.); 048GREBL3 Geosciences, Resources, Environment (2 Cr.); 048IFSBL4 Introduction to Forensic Sciences (2 Cr.); 048BMKBL4 Biomarketing (2 Cr.); 048APBBL5 Algorithmics and Python for Biologists (4 Cr.); 048NANOL5 Nanotechnologies (4 Cr.); 048BPHBL4 Biophysics (4 Cr); 048BBCBL6 Biosafety and Biosecurity (4 Cr.); 026INARL3 Artificial Intelligence (4 Cr.); 048ETSBL1 Ethics and Health (2 Cr.); 048ETTPL1 Ethics and Technology (2 Cr.); 048EEECL1 Ethics, Energy and Environment (2 Cr.); 048OCSCL1 Origin of Scientific Concepts (2 Cr.); 048JSCPL1 Scientific Journalism (2 Cr.); 048MAMPL1 The World, Current Events, and Me (2 Cr.); 048DVQCL1 Law in Everyday Life (2 Cr.); 048CITBL1 Active Citizenship: Strategy and Techniques (2 Cr.); 048SSDCL1 Sustainable Development (2 Cr.); 048ENTML6 Entrepreneurship (2 Cr.); 048SJHPL2 Successful Job Hunting (2 Cr.); 048WRNBL2 Work Ready Now (2 Cr.); 048DETML6 Designing Business Models Thinking (2 Cr.); 048TMMML2 Time and Money Management (2 Cr.); 048EMIPL2 Sociology of Emotions (2 Cr.); 048LEABL2 Social Leadership (2 Cr.)

Exclusively at CLN: 043STREL1 Society, Religion, and Ethics (2 Cr.); 358CIACL4 Citizen and Community Action (2 Cr.); 090MOC2F2 Mediation: An Amicable Means of Conflict Resolution (2 Cr.); 043HTLBL2 History of Lebanese Theater (2 Cr.); 358DTVEL2 Doubt and Truth: A Critical Reading of Facts (2 Cr.); 358LEECL1 Panorama of the Lebanese Economy I (2 Cr.); 358PLE2L2 Panorama of the Lebanese Economy II (2 Cr.); 043CULPL1 Political Culture (2 Cr.)

Exclusively at CLS: 008CETHL4 Corporate Culture and Ethics (2 Cr.); 015ABC2L3 Volunteer and Citizen Action (2 Cr.); 017CVIOF2 Non-Violent Communication (2 Cr.); 061FNEWL2 Fake News (2 Cr.); 008ETINL5 Entrepreneurship and Innovation (2 Cr.); 061WRNSL2 Work Ready Now (4 Cr.)

Open Elective Courses (6 Cr.) (to choose from the following list)
048EVMOL1 Self-Expression Through Music (2 Cr.); 048SPAOL3 Simulation of Piloting and Civil Aviation I (2 Cr.); 435LALAL2 Arabic Language and the Arts (2 Cr.); 435LALML2 Arabic Language and the Media (2 Cr.); 048TCSOL2 Theater and Self-Discovery (2 Cr.); 048GESAL4 Basic Pre-Rescue First Aid (2 Cr.); Sports Badminton/Futsal/ Basketball (2 Cr.)

SUGGESTED STUDY PLAN

Semester 1

Code	Course Name	Credits
048CSCCL1	General Chemistry I	6
048OGOBL1	General Organization of Organisms: From Cells to Organs	6
048MTHBL1	Mathematics I	2
048ODVBL1	Origin and Diversity of Life	6
048PTEBL1	Planet Earth and Environment	6
	1 Institution's Elective Course: USJ General Education Program- Humanities	2
	1 Open Elective Course - Arabic Course	2
	Total	**30**

Semester 2

Code	Course Name	Credits
048DAVBL2	Development of Animal and Plant Organisms	6
048GEGBL2	Genes and Genomes	6
048AHUBL2	Human Anatomy	2
048MTHBL2	Mathematics II	4
048PPBBL2	Physics for Biologists	6
064VALEL1	USJ Values in Daily Life	2
	1 Institution's Elective Course: USJ General Education Program - Social Sciences	2
	1 Open Elective Course - Arabic Culture and Language	2
	Total	**30**

Semester 3

Code	Course Name	Credits
048STOCL3	Basics of Stereochemistry and Organic Chemistry	4
048BMABL3	Biochemistry of Macromolecules	6
048EAEBL3	Ecology, Adaptation, and Molecular Evolution	6
048GFMBL3	Fundamental and Molecular Genetics	6
048PRSCL3	Probability and Statistics	4
	1 Institution's Elective Course: 048BUICL1 Advanced Document and Data Management or 048GREBL3 Geosciences, Resources, Environement	2
	1 Institution's Elective Courses: USJ General Education Program - Humanities	2
	Total	**30**

Semester 4

Code	Course Name	Credits
048GEOBL4	Applied Geology	2
048BITBL4	Biotechnologies	4
048TCOBL4	Communication Techniques	4
048EFMBL4	Fundamental and Molecular Enzymology	6
048BIFBL4	Functional Biochemistry	2
048PMYBL4	Parasitology and Mycology	2
048PVEBL4	Plant Physiology	4
	1 Institution's Elective Course: 048IFSBL4 Introduction to Forensic Sciences or 048BMKBL4 Biomarketing	2
	1 Institution's Elective Courses: USJ General Education Program - Social Sciences	2
	1 Open Elective Course	2
	Total	**30**

Semester 5

Code	Course Name	Credits
048BCACL5	Advanced Cell Biology	4
048BTABL5	Basics of Food Toxicology	4
048ANGLL5	English	4
048IMFBL5	Fundamental Immunology	6
048BCMBL5	Metabolic Biochemistry	6
	1 Institution's Elective Course: 048APBBL5 Algorithmics and Python for Biologists or 048NANOL5 Nanotechnologies	4
	1 Institution's Elective Courses: USJ General Education Program - Humanities	2
	Total	**30**

Semester 6

Code	Course Name	Credits
048BAVBL6	Bacteriology and Virology	6
048BIIBL6	Bioinformatics	2
048BIMBL6	Molecular Biology	6
048PDOBL6	Organ Physiology	6
048PPHBL6	Paleontology, Paleoenvironments and Evolution of Hominids	4
	1 Institution's Elective Course: 048BPHBL4 Biophysics or 048BBCBL6 Biosafety and Biosecurity or 026INARL3 Artificial Intelligence	4
	1 Institution's Elective Courses: USJ General Education Program - Social Sciences	2
	Total	**30**

COURSE DESCRIPTION

048CSCCL1 General Chemistry I 6 Cr.

This course aims to provide an in-depth understanding of the basic concepts of general chemistry in aqueous solutions. By the end of this course, students will be able to grasp the principles of chemical thermodynamics, chemical equilibria between molecules and ions before studying redox reactions and chemical kinetics.

048OGOBL1 General Organization of Organisms: From Cells to Organs 6 Cr.

The General Organization of Organisms: From Cells to Organs course aims to describe the constitution of living organisms within the various prokaryotic and eukaryotic kingdoms.
In the animal cell biology part, a description of the content of eukaryotic and prokaryotic cells is provided, as well as the chemical composition of the cellular environment and the function of various organelles. The study of different elements of the cytoskeleton and those of the extracellular matrix is addressed before concluding this part of the course with a brief introduction to the cell cycle and the description of the levels of competence of stem cells.
In the animal histology part, all tissues of the organism are explored in terms of histogenesis, composition, structure, biological characteristics, location, different types, and function. We also address the respective renewal of tissues, cellular exchanges within them, as well as the most common tissue pathologies.
In the plant cell biology part, the plant cell is explored in terms of the composition and structure of the extracellular wall, the lipid bilayer, as well as the function of cytoplasmic organelles including various plastids.
In the plant histology part, we address the different types of plant tissues formed by primary and secondary meristems. The primary covering, secretory, fundamental, conducting tissues, as well as phellogen and conducting secondary tissues, will be studied in detail.

048MTHBL1 Mathematics I 2 Cr.

This course introduces the main methodological tools necessary for the analysis and understanding of simple biological and chemical phenomena. This course consists of theory without demonstrations, exercises of direct application, and then applications from various fields of biology and chemistry. Students who have completed this course will be able to describe a phenomenon using a function and study various elements of a curve: calculate limits and derivatives, and analyze the direction of variations. They will also be capable of performing the calculation of the integral of functions over an interval.

048ODVBL1 Origin and Diversity of Living Organisms 6 Cr.

This course allows students to explore the diversity of the living world: bacteria, protists, plants, fungi, and animals. This course is divided into several parts:
The first part details the abiotic conditions of the primitive earth that favored the appearance of life, the phylogenetic classification of living organisms, and the binomial nomenclature of species.
The second part addresses the evolution of land plants, mosses (bryophytes), ferns (pteridophytes), and gymnosperms.
The third part explores the kingdom of fungi.
The fourth part explores the evolution of animals from invertebrates to vertebrates.

048PTEBL1 Planet Earth and Environment 6 Cr.

This course tackles the structure of planet Earth and focuses on phenomena such as plate tectonics and volcanism. Next, we focus on materials of the earth's crust; minerals first. Then come the different types of rocks: igneous, sedimentary, and metamorphic rocks. It aims to recognize the different formation histories of the three types of rocks. A final chapter deals with continental and oceanic sedimentation. It details the stages of soil formation, the links between parent rock, climate, and formed soil. Practical work in mapping and mineral recognition will support the course.

048DAVBL2 Development of Animal and Plant Organisms 6 Cr.

The Development of Animal and Plant Organisms course aims to explain the modes of reproduction as well as the different stages of development of animal and plant organisms. At the animal kingdom level, it teaches the different modes of reproduction, sexual and asexual, and the processes and modalities involved. It also presents an introduction to embryology, especially in mammals with examples on the growth and development of certain systems, including the cardiovascular system and the nervous system. The plant part of the course focuses on flowering plants (angiosperms). In this part, we address, in detail, the classification and architecture of angiosperms, the vegetative apparatus (leaves, stems, and roots) and their adaptations to terrestrial environments, the life cycle of angiosperms (flower, pollination, fruit formation, seeds and their dispersion), form and duration of life as well as primary and secondary growth (wood formation).

048GEGBL2 Genes and Genomes 6 Cr.

This course explores the molecular basis of heredity. It covers a detailed description of the structure and the characteristics of the DNA molecule and discusses the concept of genes from a perspective that encompasses their molecular organization and the expression of hereditary information. Students will gain an understanding of both eukaryotic and prokaryotic genome organization, including genome size, chromosome structure, ploidy levels, and their relevance to species and speciation concepts. Additionally, formal genetics is discussed in relation to molecular and cellular processes such as DNA replication, cell division, and fertilization. This knowledge is essential for developing both theoretical insights and practical skills in fundamental and molecular genetics.

048AHUBL2 Human Anatomy 2 Cr.

This course takes an approach to human anatomy by region with basic concepts necessary for understanding physiological concepts. It covers concepts related to the skeletal, muscular, and vascular systems of the head, thorax, abdominal-pelvic region, and limbs. In addition, a detailed study of the anatomy of sensory organs and vital organs is discussed. With its general organization, this course is tailored to the needs of biology students to introduce them to the human body and prepare them to link healthy anatomy, physiology, and pathophysiology.

048MTHBL2 Mathematics II 4 Cr.

This course follows on from the Mathematics I course in the first semester. It presents the main methodological tools necessary for the analysis and understanding of simple biological phenomena. The course consists first of a minimum of necessary theory, without demonstrations, followed by exercises of direct application, and then illustrations and applications from various domains of biology.

048PPBBL2 Physics for Biologists 6 Cr.

This course is one of the cornerstones of a natural sciences education. Indeed, it allows for the development of know-how by dealing with a variety of problems in biomechanics, bioelectricity, and introducing biophysics. The practical work includes five subjects (see PW content below) which will be carried out based on rotating manipulations during which students are divided into pairs or trios.

064VALEL1 USJ Values in Daily Life 2 Cr.

This course aims to heighten students' awareness of the core values of the Saint Joseph University of Beirut (USJ) with the objective of integrating these values into their personal lives, interpersonal relationships, and professional conduct. Additionally, it encourages critical reflection on how the values outlined in the USJ Charter can influence their behaviors, actions, and decision-making processes in response to the challenges of the modern world. Furthermore, the course assists students in recognizing global issues and ethical responsibilities, while equipping them to make positive contributions towards the advancement of a better society.

048STOCL3 Basics of Stereochemistry and Organic Chemistry 4 Cr.

This course introduces the fundamental concepts essential for understanding organic chemistry: orbital overlaps, chemical bonds, atomic orbital hybridization, resonance, thermodynamic and kinetic aspects of chemical transformations, electrophiles and nucleophiles, electron-donating and electron-withdrawing groups, acid and base strength, and the effects of solvents. Stereochemistry, which describes the spatial arrangement of molecules, are also covered. Following this, specific chapters focus on alkanes and haloalkanes, alcohols, ethers and their sulfur analogs, alkenes and alkynes, aromatic compounds, and carbonyl compounds. These chapters cover the nomenclature, structure, physicochemical properties, preparation methods, and reactivity of each compound family. Emphasis is placed on reaction mechanisms. This course includes lab sessions, allowing students to become familiar with the equipment used in organic chemistry and to apply some of the studied reactions.

048BMABL3 Biochemistry of Macromolecules 6 Cr.

The Biochemistry of Macromolecules course aims to explore the structures and biochemical properties of biomolecules essential for the functioning of any living organism. Three major families will be studied: carbohydrates (simple sugars, polysaccharides; reserve and structural polysaccharides; glycoconjugates), lipids: (classes; structures and biological functions, behavior in water) as well as proteins (amino acids, peptides, proteins, levels of primary, secondary, tertiary, and quaternary structures). Various lab activities reinforce the theoretical part with interesting applications: Sugar chromatography, qualitative and quantitative analysis of sugars, lipids, and amino acids.

048EAEBL3 Ecology, Adaptation, and Molecular Evolution 6 Cr.

The Ecology, Adaptation, and Molecular Evolution course allows students to acquire basic concepts in ecology and understand the processes and factors governing the structure and dynamics of populations, communities, and ecosystems.
The adaptation and evolution components enable students to understand the influence of ecological factors, biogeography, population dynamics, and genetics on the emergence of adaptations and evolutionary processes and on speciation.

048GFMBL3 Fundamental and Molecular Genetics 6 Cr.

The course aims to enhance students' understanding of the relationship between phenotype and genotype through the central dogma of biology, i.e. the DNA-RNA-protein pathway. It covers classical genetics, including

mutant selection, identification of allelic series, and mapping, as well as the exploration of gene interactions and the application of basic molecular biology techniques to study gene function. These concepts are further reinforced through practical sessions and a literature review aimed at comprehending the genetic basis of human diseases.

048PRSCL3 Probability and Statistics 4 Cr.

This course introduces statistics as a decision tool through acquainting students with the following: understanding and analyzing statistical data, and numerically and graphically describing data. Students will also be capable of conducting the calculus of probability and deciding between the use of parametric and non-parametric tests in order to compare the statistical mean of two populations or more.

048BUICL1 Advanced Documents and Data Management 2 Cr.

The course provides the way to produce, process, exploit, and disseminate digital documents that combine data of different natures. Attendees will implement the new acquired skills using common document production software (text, slideshow, spreadsheet, referencing software, chemistry drawings, online document on various media).

048GREBL3 Geosciences, Resources, Environment 2 Cr.

This course focuses on surface geology, with the fundamental disciplines necessary to acquire the ability to understand and interpret the various geological phenomena and structures that shape the Earth's surface, and the major anthropogenic risks that can affect it.

048GEOBL4 Applied Geology 2 Cr.

This course aims to correlate the fundamental notions required to the sets of applications of geology in relation to human activities in the economic and industrial fields, particularly those related to the investigation and exploration of essential natural and geological resources such as water resources, oil, and geomaterials.

048BITBL4 Biotechnologies 4 Cr.

This course aims to introduce students to modern biotechnology tools. After an exhaustive presentation of all cloning vectors, the focus is on how to clone and then on the different post-cloning approaches. Namely, encapsulation in lipid nanoparticles, in phages, and in viral particles infecting bacteria or eukaryotes for therapeutic purposes. The applications of gene therapy to treat certain diseases and for the development of modern vaccines will follow, ending with bioreactors and the production conditions of bioactive molecules and cells on a large scale.

048TCOBL4 Communication Techniques 4 Cr.

The Communication Techniques course has two axes: the first provides an in-depth exploration of fundamental principles and the development of essential skills in verbal, non-verbal, and written communication, preparing students to interact professionally and impactfully in their future fields of activity.
The second axis aims to provide students with the essential skills for a successful transition to the professional world after obtaining their Bachelor in Life and Earth Sciences - Biochemistry. Students will apply the skills acquired in the first part in personal work. They will learn to individually analyze their profile, taking into account their interests, skills, and professional aspirations. They will also be able to recognize the career prospects and potential profiles resulting from their degree, while characterizing the skills and qualities required to excel in each field. An in-depth assessment of career plans associated with these prospects will be carried out, enabling students to make informed decisions. Finally, participants will learn to choose a profile or career path based on their personal and professional goals, collect relevant information related to this choice, and communicate this information clearly and effectively through the creation of a scientific poster illustrating their chosen profile and an oral presentation.

048EFMBL4 Fundamental and Molecular Enzymology 6 Cr.

This course presents the various approaches to the quantitative study of proteins and enzymes: formalism corresponding to the interaction and the equilibrium between proteins and ligands. The Michaelis model, the enzyme inhibition, the analysis of pH and temperature effects on the proteins and enzymes will be explored and the Monod-Wyman-Changeux model will be used to describe allosteric enzymes. This course also provides detailed information on molecular aspects of enzymatic reactions. The enzyme kinetics for several substrates and their experimental verification are well developed. The structure and composition of catalytic sites are addressed. An overview of enzyme technology as a part of enzyme engineering used today in several industries is presented at the end of this course.

048BIFBL4 Functional Biochemistry 2 Cr.

The aim of functional biochemistry is to explain the physiology and functioning of the cell based on the role of the various cell organelles and the macromolecules that compose them. Three main aspects are addressed in this course: How the cell exchanges with its external environment, how it sets up its proteins, and how it responds to a signal. To this end, a detailed chapter on the different types of transport across the cytoplasmic membrane is provided, followed by a discussion of various applications and their physiological importance (heartbeat, muscle contraction, taste, sound, light perception, etc.). The study of protein targeting to different destinations deals in detail with all phenomena accompanying the establishment of proteins necessary for cellular function.
A chapter detailing the cellular response to different types of ligands, the different types of receptors, and the corresponding transduction signals concludes the theoretical part of the course. The analysis of a scientific article as a practical session allows students to apply all the acquired knowledge of the course in a single glandular model.

048PMYBL4 Parasitology and Mycology 2 Cr.

The Mycology section focuses on identifying and characterizing filamentous fungi that produce mycotoxins, which cause diseases in humans, animals, and plants. It examines the interactions between fungi and hosts, provides a detailed description of fungal infections in humans, animals, and plants, and addresses food contamination by mycotoxins such as Aflatoxins, Ochratoxins, Trichothecenes, and Patulin. Additionally, it explores various techniques for treating, preventing, and decontaminating major fungi and mycotoxins, and discusses diagnostic methods for detecting fungi directly and indirectly through mycotoxins. The Parasitology section covers general epidemiological parasitology, offering detailed information on various parasitic infections. This includes the causal parasites, parasitic reservoirs, intermediate and definitive hosts, parasite morphology, epidemiological cycles, symptoms, diagnostics, prevention, prophylaxis, and treatment.

048PVEBL4 Plant Physiology 4 Cr.

The Plant Physiology course aims to study the functioning of plant tissues and organs as well as the mechanisms governing these functions and the influence of internal and external factors. The course covers the essential physiological functions of plants such as resource acquisition (water, mineral and organic elements), growth and development, defense, and plant response to environmental stresses.

048BMKBL4 Biomarketing 2 Cr.

This course is designed to provide students with an in-depth understanding of marketing strategies in the pharmaceutical, food, cosmetic, and biotechnology sectors. Students will learn the fundamental principles of marketing, how to create and write product positioning, and how to conduct a SWOT analysis to evaluate a product's strengths, weaknesses, opportunities, and threats. The course also explains the operations of pharmaceutical firms, highlighting the specific aspects of the industry. Students will develop practical skills in identifying effective sales techniques and classifying customers according to their profiles. Through a combination of case studies, practical workshops, and in-depth analyses, this course prepares students to excel in marketing products related to biology and chemistry and to seize career opportunities in the life sciences industry.

048IFSBL4 Introduction to Forensic Sciences 2 Cr.

This course aims to give students an understanding of forensic science. It places emphasis on the role of the trace material as a clue in criminal investigations. The importance of critically evaluating the information content and

the means by which they were obtained in the process of criminal cases is also discussed. Students are introduced to a range of trace types, to the scientific methodology applied to the collection, analysis and interpretation of these traces and to the analytical methods that are used in relation to case studies.

048BCABL5 Advanced Cell Biology 4 Cr.

In the first part, this course provides a detailed treatment of cell culture and various techniques used to explore cultured cells and their organelles. In the second part, after studying the cell cycle, cytoskeletal dynamics, and centrosome division, mitochondria, endoplasmic reticulum/Golgi apparatus, we discuss the fate of a cell during its life: cell proliferation, cell division arrest, response to cell damage, aging, differentiation, stem cells, apoptosis, carcinogenesis, and metastasis, which we address after explaining the link between the cell and its extracellular matrix.

048BTABL5 Basics of Food Toxicology 4 Cr.

This course aims to increase awareness of the health risks associated with substances in food. It involves analyzing and understanding the toxic effects, sources, and mechanisms of action of various residual pollutants and additives found in food. Additionally, the course provides a brief overview of the main industrial processes used to preserve food and extend its shelf life.

048ANGLL5 English 4 Cr.

This course is designed to develop critical thinking, reading, oral and writing skills. It focuses on synthesizing sources, producing a research paper and defending it in front of an audience. Emphasis is on the analytical reading of different text types required in the disciplines as well as on synthesis from a variety of sources to produce a written text and present it orally.

048IMMBL5 Fundamental Immunology 6 Cr.

The course aims to impart students with essential principles of immunology, equipping them to comprehend and analyze the molecular and cellular responses triggered during infections. The course begins with an introductory overview of the history of immunology and the pivotal discoveries that have shaped our current understanding of the immune system. The introduction also provides a comprehensive summary of the immune system, which will be elaborated upon in subsequent chapters. Students are introduced to several techniques that utilize antibody properties and their practical applications. In practical sessions, students are guided through experimental protocols involving agglutination tests, immunoprecipitation, and ELISA tests and to interpret the results obtained from these experiments.

048BCMBL5 Metabolic Biochemistry 6 Cr.

This course is structured around four axes. The first recalls the laws of bioenergy in biochemistry especially those interfering with metabolism. The second and third axes are devoted to catabolism and anabolism pathways, the energy characteristics of metabolic links are systematically analyzed. The fourth axis deals with the detoxification of xenobiotics and the fifth with the most experienced metabolic diseases.

048APBBL5 Algorithmics and Python for Biologists 4 Cr.

To start learning programming languages, Python is one of the best choices due to its readability, algorithmic simplicity, and given that it is a freely available software. Therefore, it is generally the first programming language taught to students who have no programming background, such as biologists.
The proposed methodology first focuses on discovering possible applications using this type of language to demonstrate the importance of learning to master Python. Learning by practice allows for direct application of acquired knowledge (“learning by doing”).
The course aims to work on data processing related to biology.
Finally, this course allows students to acquire notions about the syntax and structure of a program in the Python language and to know how to compile lines of code based on the logic learned to write an algorithm.

048NANOL5 Nanotechnologies 4 Cr.

Nanotechnologies are becoming increasingly present in our daily lives and represent a rapidly growing market. This course aims to capitalize on the knowledge accumulated by L3 students during their scientific studies. It covers basic knowledge of nanomaterials and nanotechnologies that have or will have a significant impact in scientific, technological, economic, and even societal domains. After a general introduction to nanoscience, the course provides an overview of the main methods of nanoscale manufacturing. In particular, it demonstrates how nanotechnology tools (e.g., near-field microscopies, lithography) can be used to understand, and even transform, bio and/or organic systems at the atomic and molecular level, on one hand, and to what extent the basic principles (self-assembly) of biology can be exploited to manufacture new materials and devices, on the other hand. Additionally, this course discusses the potential contribution of nanomaterials in various fields such as medicine, electronics, space, biotechnology, biomedical, environment, and optics. Current research topics in nanoscience is presented and discussed to understand the new properties sought at a very small scale.

048BAVBL6 Bacteriology and Virology 6 Cr.

In the Bacteriology section, following an introduction and a historical overview, a review of the main discoveries of microorganisms completes Chapter 1. A presentation of the ultrastructure of a bacterial cell, as well as the biochemical composition and function of cellular structures, is addressed. A detailed description of the classification and distinctive characteristics of major bacterial groups is studied. The dynamics of bacterial population evolution and basic concepts of bacterial genetics will follow. The various relationships between the host and the pathogen are presented, leading to a discussion of antibiotics and their modes of action on bacterial cells.
In the Virology part, the essential data of viral infections, viruses' replications and virological diagnostic methods are illustrated. Also, the different mechanisms of viral infections with a systematic presentation of those that are mostly common are covered.

048BIIBL6 Bioinformatics 2 Cr.

This course provides a comprehensive overview of the field of bioinformatics and its constantly evolving tools. By the end of this course, students will have the essential bioinformatics skills needed to successfully conduct a research project. The first section focuses on utilizing databases such as NCBI, KEGG, EMBL, and SBI, and on the storage and organization of bibliographic and biological data. Subsequently, the second part focuses on the analysis of nucleotide and protein sequences. This includes characterizing these sequences, mRNA and CDS sequence identification, alignment, blast, primer design, identifying and extracting SNPs and InDels, and constructing phylogenetic trees. Moreover, protein domain analysis is the subject of the final section of the course. Tools such as CDART and Phyre2 enable the comparison of proteins based on their domains rather than their sequences. Finally, the last chapter illustrates the role of bioinformatics in constructing recombinant DNA. Students will be invited to use tools like Benchling.
At the end of each section, students will apply the acquired concepts through practical exercises. Their midterm evaluation and final grade will each be based on a project encompassing the various concepts learned.

048BIMBL6 Molecular Biology 6 Cr.

This course focuses specifically on gene expression and post-transcriptional modifications in prokaryotes and eukaryotes. Following an introduction covering the structure of nitrogenous bases, DNA structure, a review of restriction enzymes and DNA digestion, and an exhaustive explanation of the role of topoisomerases in prokaryotes and eukaryotes, the course progresses to discuss the various types of RNA present in the cell and their structure (mRNA, tRNA, rRNA, snRNA, snoRNA, miRNA, siRNA). A detailed description of transcription and maturation of different types of RNA, as well as the regulation of their transcription in eukaryotes and prokaryotes, is provided. The different steps of translation and the corresponding energy balance, in both eukaryotes and prokaryotes, are then covered. The various levels of gene expression regulation and the concept of epigenetics are presented, followed by a description of different types of introns, ribozymes, and inteins. The final chapter discusses various enzymatic tools of molecular biology, which are discussed through Supervised Practical Work (TPC), including methods for RNA extraction, RT-PCR, and construction of a cDNA library.
The lab work begins with an introduction to the necessary calculations and instructions related to laboratory equipment and material preparation before initiating an experimental protocol. It then covers the preparation of competent cells and bacterial transformation using various plasmids. Verification by colony PCR of the presence

of the insert follows before conducting a mini-prep. This involves extraction of plasmid DNA and digestion of the extracted DNA to create the corresponding restriction map. In parallel, students are tasked with searching for a gene sequence from GENBANK, identifying the coding region, performing WebCutter analysis, and creating restriction maps of a gene in order to compare the predicted profile with the obtained one.

048PDOBL6 Organ Physiology 6 Cr.

The Organ Physiology course presents the fundamental principles of physiology along with the normal functioning of the human body. The various chapters cover major systems or parts of human physiology, addressing functional anatomy, general physiology reviews, different mechanisms and processes related to their physiological function, potential interactions with other systems and/or regulations, and some elements of pathophysiology. Emphasis is placed on the integrated nature of systemic physiology, considering the human organism as a set of interdependent systems under the control of synergistic homeostatic processes.
Practical work allows students to master the execution of a blood formula/count and learn how to perform and interpret ECG and blood pressure measurements.

048PPHBL6 Paleontology, Paleoenvironments and Evolution of Hominids 4 Cr.

The first part of the course, "Paleontology," consists of three sections:
General introduction to paleontology; General history of the biosphere: theories of the origin of life and the description of the biosphere during different geological eras, and major biological crises: the definition, characteristics, causes, and consequences of crises; the coupling between geological and biological events and the impact on the evolution of species.
The second part focuses on the study of paleoenvironments and the various methods used to read and reconstruct the past.
The third part concerns the evolution of hominids and the major milestones in the saga of Homo sapiens. This includes its divergence from other great apes, the adaptation of its morphology and abilities to become a hunter-gatherer, the improvement of its techniques to create and develop increasingly complex tools, the domestication of fire, the development of an elaborate language, the initiation into art, and the gradual shaping of its social organization to resemble our own.

048BBCBL6 Biosafety and Biosecurity 4 Cr.

This course aims to expand the laboratory biosecurity concepts and to strike a balance between the long-known biosafety procedures and practices. It further introduces the overarching "biorisk management" approach that has resulted from careful thinking, comprehensive study of prevailing practices and recommendations, review of international norms and standards, and relevant ethical considerations.

048BPHPL4 Biophysics 4 Cr.

This course aims to introduce students to the scientific interface between multiple domains, including physics, biology, and chemistry. Several applications of physics in the realm of living organisms are supported by the concepts acquired during class sessions. Laboratory practical sessions complement the level of application required through experimental manipulations.

026INARL3 Artificial Intelligence 4 Cr.

This course aims to study artificially intelligent agents. It portrays several methods of implementing these agents: from simple reflex agents to utility-based agents as well as learning agents. We first cover greedy and A* search as well as the implementation of games through the minimax algorithm. We then introduce some basic supervised Machine Learning algorithms such as regression and classification. We finally apply these algorithms to realistic datasets via Python implementations using libraries such as Scikit-learn, Tensorflow and Keras.

048ETSBL1 Ethics and Health 2 Cr.

This course addresses bioethics by broadening its scope to include social and collective issues. The study of clinical cases, situational analysis, and discussions help train students to better analyze and evaluate their daily lives. Research ethics will also be an integral part of this course. It encourages a positive attitude of reflection, awareness, and sensitivity to the ethical dilemmas' researchers may encounter in their professional lives.

048EEECL1 Ethics, Energy, and Environment 2 Cr.

The course aims to introduce students to ethical choices in the context of energy use, energy production, and environmental protection. The course is structured around the following themes: Energy choices and their ethical consequences, Environmental protection and environmental rights, Social responsibility and governance, Climate change: science, ethics, and politics, Ethics of renewable energies: advantages and disadvantages, Ethics of energy consumption: individual choices and social responsibility.

048ETTPL1 Ethics and Technology 2 Cr.

This course focuses on the ethical issues related to the use of technology, such as surveillance, privacy, automation, artificial intelligence, autonomous weapons, and more. Its objective is to help students understand the ethical implications of their work and develop critical thinking about their role as scientists in society. Example topics include: definitions and key concepts in the ethics of technology; the evolution of technology and its impact on society; reflection on the values and ethical principles involved in the technological context; surveillance and privacy; ethical issues in the collection and use of personal data; ethical challenges of artificial intelligence and machine learning; ethics in the design and use of technology; debates on ethical issues related to bioelectronics, virtual reality, genetic modification technology, etc.; and the ethics of emerging disruptive technologies and their societal impact.

043STREL1 Society, Religion, and Ethics (at CLN) 2 Cr.

This course offers a dynamic of reflection and research on the relationships between evolving society and religion which can slow down or support this development, and how ethical questions can intervene and at what level. As a result, the course analyzes the relationships between the three monotheistic religions and society through themes that affect the political and civil life of citizens such as the question of secularity and secularism and questions that are corollaries to it such as that of civil marriage. Other questions that are tackled address the relationship between religion and the development of society: the LGBTQ question, that of cohabitation, euthanasia and other various themes.

048DVQCL1 Law in Everyday Life 2 Cr.

This course aims to familiarize students with the basic concepts of law, providing a pedagogical introduction to an essential but seemingly daunting subject, especially for science students. The goal is to enable these students to understand current legal issues, know their basic rights and obligations as citizens, and understand their national legal system in relation to international law. Through examples, this course helps students locate and decipher legal texts, relevant references in legislation, or international conventions. Finally, also through example, this course ensures respect for the etymology of words and legal terminology.

048CITBL1 Active Citizenship: Strategy and Techniques 2 Cr.

This course is designed for students of the Faculty of Science to enable them to experience citizenship and explore various forms of civic practices in Lebanon and around the world.

048SSDCL1 Sustainable Development 2 Cr.

This course aims to introduce students to the interconnectedness between various sectors of human life, sustainable development, and the Sustainable Development Goals (SDGs) established by the United Nations. It also aims to define the role of public and private entities in implementing these goals.

358CIACL4 Citizen and Community Action (at CLN) 2 Cr.

This course is designed to enable the development of a sense of civic leadership in USJ students and provide them with the necessary skills to help them successfully accomplish their mission. (1) Become familiar with the social and community context of your own environment. (2) Develop citizen leadership/change agent. (3) Acquire tools for managing citizen engagement projects

048OCSCL1 Origin of Scientific Concepts 2 Cr.

The objective of this course is to introduce students to the process of conducting reflexive analysis on the origins and development of scientific concepts as well as the history of scientific disciplines. The intent is to develop their critical thinking skills in relation to the examination of the current connections among epistemology, science philosophy, and science history. The various epistemological currents and ideas that have influenced the development of scientific knowledge are also covered. Understanding contemporary scientific ideas in the fields of mathematics, physics, chemistry, and life sciences requires these reflective components. Science education and the stance of the scientific researcher are influenced by the epistemological analysis of the development of scientific theories.

048JSCPL1 Scientific Journalism 2 Cr.

This course is designed to teach students the basic techniques and rules governing journalistic writing. At the end of this course, students will be able to master the basic techniques of journalistic writing, assess the relevance of scientific information likely to be published (choice of information) in the general press and write a journalistic news item as well as a scientific press article.

048MAMPL1 The World, Current Events, and Me 2 Cr.

This course encourages students to think about the major issues that dominate current events and impact the country and the world. Through an analysis of the news that affects them, the news everyone is talking about, and the news that fuels public debate, students will learn to develop their critical thinking and express their viewpoints, particularly during this period of health, economic, social, and political crises that Lebanon is experiencing.

090MOC2F2 Mediation: An Amicable Means of Conflict Resolution (at CLN) 2 Cr.

(1) Identify the different types of conflicts. (2) Master the mediator's tools. (3) Prevent and resolve conflict situations using mediation techniques.

043HTLBL2 History of Lebanese Theater (at CLN) 2 Cr.

Evolution of Lebanese theater throughout the history of Lebanon. History and names of the playwrights who created this theater. Various types of theaters, etc.

358DTVEL2 Doubt and Truth: A Critical Reading of Facts (at CLN) 2 Cr.

This course leads students to develop a critical outlook and spirit allowing them to analyze and interpret the events as well as the circumstances that surround them. It allows them to analyze speeches and films to open their eyes and their mind using socio-philosophical reading grids.

048ENTML6 Entrepreneurship 2 Cr.

In the fast-evolving world that we are experiencing in our daily life, mostly the work environment, where traditional career paths are being redefined by innovation and technology, it is important for students to be exposed to the fundamentals of entrepreneurship, and include the entrepreneur mindset in today's generation. Therefore, students should receive the right education and support from the institutions. In addition, students have the right to be exposed and to learn that they have other paths than the traditional way.

048SJHPL2 Successful Job Hunting 2 Cr.

The course is designed to introduce students to professional life and its demands in terms of personal development and technical knowledge.

1- Responding to a job offer (application e-mail, cover letter, CV)
2- How to pass a job interview (dress code; body language; how to present yourself; dos and don'ts; etc.)
3- Searching for a job offer (profile on LinkedIn; search for an offer on LinkedIn, etc.; post your CV on Monster, Bayt and co, etc.; searching for job offers on the websites of institutions, companies, hospitals, industries, etc.)

048WRNBL2 Work Ready Now 2 Cr.

The Work Ready Now program was developed to provide young students with the essential skills and knowledge needed to find and keep a job. This program, created by Higher Education Capacity Development (HECD), was designed in a participatory and practical manner so that students are actively involved in the learning process, gaining new skills and self-confidence to secure and maintain employment. Additionally, the learning methods allow students to develop digital skills through the use of free online software.

048DBMML6 Designing Business Models 2 Cr.

Many students enter the professional world without a clear understanding of how business works and, most crucially, how to be useful when thinking about business problems, big and small. This course is designed around business case studies that will give opportunities to try to understand how and why different businesses operate in various sectors.

048TMMML2 Time and Money Management 2 Cr.

The Time and Money Management course aims to enlighten undergraduates about the choices to be made for extraordinary productivity. Moreover, this course enables students to have a clear understanding of various means of investments in several industries comprising: stock market, life insurance, private banking and retail banking.

048EMIPL2 Sociology of Emotions 2 Cr.

This course familiarizes students with the sociological theories of emotions, explores the impact of emotions on individual and collective decisions, and analyzes social interactions through the prism of emotions.

048LEABL2 Social Leadership 2 Cr.

Social leadership is a concept that refers to the emotional and empathetic style of leaders who prioritize connection, collaboration, and communication. These leaders recognize the significance of cultivating strong relationships within their teams and fostering a positive work environment.
Being a social leader involves knowing how to nurture trust, care, and respect within the team. Upholding these values enables team members to freely share ideas, fostering an open atmosphere an ever-changing work climate. In contrast to formal leaders, social leaders do not solely rely on position or title to achieve objectives. Instead, they leverage emotional intelligence and interpersonal skills to influence others. This approach enhances the effectiveness in today's workplace, where employees seek meaning and purpose in their work.
Upon completing this course, students will be able to:

- Identify the values and principles of social leadership.
- Develop essential skills for becoming a social leader.
- Define their purpose and guide their team on this same track.
- Understand the 9 core principles of the NET Model.
- Identify areas of strength and areas that need improvement.

358LEECL1 Panorama of the Lebanese Economy I (at CLN) 2 Cr.

This course provides an overview of fundamental economic concepts, in order to understand how the Lebanese economic crisis arose. We will first introduce the political regime of "consociational democracy" to understand the roots of high levels of inequality in the Lebanese society. Second, we will present the results and conclusions of the World Bank's recent work on Lebanon's economic situation. Third, we will focus on three macroeconomic variables: gross domestic product (GDP), inflation and unemployment, which are key measures of a country's economic performance.

358PLE2L2 Panorama of the Lebanese Economy II (at CLN) 2 Cr.

Lebanon and the International Monetary Fund (IMF) have reached a conditional agreement to release a $3 billion loan in April 2022 to help the country stem the worst economic crisis in its history. What should be done? To deal with all this chaos, the course provides and explains several solutions that can be implemented as a first step

towards economic reforms and recovery: first, tackling inequality through progressive taxation; secondly, the negotiation between the Lebanese authorities and the IMF for an assistance and reform package; thirdly, the adoption of full dollarization or a currency board regime which could suit Lebanon to improve the quality of the national currency and guarantee the definitive end of the depreciation of the currency.

043CULPL1 Political Culture (at CLN) 2 Cr.

What is politics? What is the meaning of the term "politics"? What is the purpose of politics? What are the different political bodies? What are they for? How to define the various political regimes? What is the relationship between politics and religion?

048EVMOL1 Self-Expression Through Music 2 Cr.

Choosing a selection of songs in various languages: Arabic, French, English, and Italian. The aim is to create a group project that motivates students to express themselves either through music or with their own words.

048SPAOL3 Simulation of Piloting and Civil Aviation I 2 Cr.

The aim of this course is purely instructional and does not claim to be a real pilot training course. However, in the world of digital simulations, we strive to bring our tools as close as possible to the desired reality, sometimes reaching relatively advanced levels of virtuality. In this course, students will be introduced to basic concepts related to the use of a single-engine aircraft with a fixed-pitch propeller. Navigation concepts and standards for various European regions will be introduced in a simple manner to give enthusiasts an idea. The use of airport charts for takeoffs and landings is also introduced. The ultimate goal is to be able to start a training aircraft, perform a proper takeoff, and navigate through the sky in preparation for a landing following Visual Flight Rules.

048TCSOL2 Theater and Self-Discovery 2 Cr.

The theater course is aimed at students who wish to learn acting techniques in a recreational and enjoyable setting. Sessions are organized around exercises in dramatic arts such as warm-up, body expression, relaxation, trust-building games, diction exercises, voice and breathing work, mime, improvisation, body and rhythm, physical movements, motor skills, space management, and stage presence. The main objective of this course is to teach and guide students to master and enhance their presence on stage and their interaction with the audience for any type of performance: lectures, seminars, etc. Students' practice is developed on stage, both individually and collectively. In its practical dimension, teaching relies on both the pleasure and discipline of play. This teaching method primarily engages the body and voice, the actor's primary tools, and calls upon the student's creativity to respond to a given situation and invent various ways to deliver a text.

048GESAL4 Basic Pre-Rescue First Aid 2 Cr.

Recognizing emergency situations, identifying first aid procedures, and initiating first aid care.

048LALAL2 Arabic Language and the Arts 2 Cr.

This course allows students to explore the Arabic language and its culture through various forms of art, such as painting, calligraphy, and Arabic ornamentation. It provides linguistic, oral, and written skills that are practical and tangible.

048LALML2 Arabic Language and the Media 2 Cr.

This course allows students to explore the Arabic language and its culture through various forms of media, including visual, audio, and written journalism, as well as visual, audio, and written advertising. It provides linguistic, oral, and written skills that are practical and tangible.