BACHELOR IN CHEMISTRY

Main Language of Instruction:
French ☑ English ○ Arabic ○

Campus Where The Program Is Offered: CST

OBJECTIVES

This program prepares students to become scientists in the fields of organic, inorganic, analytical, physical, materials, environmental, and green chemistry.
Students will develop the ability to apply their knowledge in the analysis and interpretation of chemical phenomena observed in nature, in the laboratory, and across various industrial sectors.
They will become innovators and entrepreneurs, capable of developing new products, processes, or technologies by leveraging chemical synthesis, the analysis and characterization of substances and materials, formulation, and the principles of sustainable development. They will put their skills into practice in the chemical, pharmaceutical, cosmetic, and food industries, as well as in the environmental sector, consulting, or research.
They will have the opportunity to pursue graduate studies, nationally and internationally, to specialize and advance toward positions of responsibility.
They will also contribute to the dissemination of chemistry, whether through teaching or science communication.

PROGRAM LEARNING OUTCOMES (COMPETENCIES)

- Communicate scientific knowledge
- Explain fundamental laws, basic concepts, and essential theoretical and practical knowledge in chemistry
- Design and implement strategies for the synthesis of molecules and macromolecules
- Discuss qualitative and quantitative analytical techniques.

PROGRAM REQUIREMENTS

180 credits: Required courses (150 credits), Institution's elective courses (24 credits), Open elective courses (6 credits) and USJ General Education Program (32 credits - may be part of the above categories).

Fundamental Courses (174 Cr.)
Required Courses (150 Cr.)
General Chemistry I (6 Cr.), General Chemistry II (4 Cr.), Introduction to the Chemical Industry (4 Cr.), Mathematics I (2 Cr.), Classical Mechanics (4 Cr.), Advanced Classical Mechanics (2 Cr.), Environmental Chemistry (4 Cr.), Inorganic Chemistry (6 Cr.), Electrostatics and Electrodynamics (4 Cr.), Magnetostatics (4 Cr.), Mathematics II (4 Cr.), Basics of Stereochemistry and Organic Chemistry (4 Cr.), Biochemistry of Macromolecules (6 Cr.), Chemical Kinetics (6 Cr.), Photochemistry and its Applications (2 Cr.), Probability and Statistics (4 Cr.), Instrumental Analysis Techniques (4 Cr.), Coordination Chemistry (4 Cr.), Complementary Organic Chemistry I (2 Cr.), Complementary Organic Chemistry II (2 Cr.), Fundamental and Molecular Enzymology (6 Cr.), Chemical Thermodynamics (8 Cr.), English Level A (4 Cr.), Organometallic Chemistry (4 Cr.), Advanced Chemical Equilibria in Aqueous Solutions (8 Cr.), Transposition and Rearrangement (6 Cr.), Introduction to Electrochemistry (4 Cr.), Atomic and Molecular Structure (8 Cr.), Polymer Chemistry (6 Cr.), Spectroscopy (6 Cr.), Synthesis Strategy (6 Cr.). USJ Values in Daily Life (2 Cr.), Scientific Communication Techniques (4 Cr.).

Institution's Elective Courses (24 Cr.)
Advanced Document and Data Management (2 Cr.), Introduction to Python (2 Cr.), Nanotechnologies (4 Cr.), Practical Applications of Chemistry (4 Cr.).
One course to be chosen from the following: Ethics and Health (2 Cr.), Ethics and Technology (2 Cr.), Ethics, Energy, and Environment (2 Cr.).
One course to be chosen from the following: Sustainable Development (2 Cr.), Law in Everyday Life (2 Cr.), Active Citizenship: Strategy and Techniques (2 Cr.).
One course to be chosen from the following: Origin of Scientific Concepts (2 Cr.), Scientific Journalism (2 Cr.), The

World, Current Events, and Me (2 Cr.).
One course to be chosen from the following: Successful Job Hunting (2 Cr.), Entrepreneurship (2 Cr.), Work Ready Now (2 Cr.).
Two courses to be chosen from the following: Designing Business Models (2 Cr.), Time and Money Management (2 Cr.), Social Leadership (2 Cr.), Sociology of Emotions (2 Cr.).

Open Elective Courses (6 Cr.)

USJ General Education Program (32 Cr.)

Code	Course Name	Credits
	ENGLISH OR OTHER LANGUAGE	**4**
048ANGLL5	English Level A	4
	ARABIC	**4**
	Arabic Language and Culture	**2**
435LALML2 **or** 435LALAL2	Arabic Language and the Media **or** Arabic Language and the Arts	2
	Other Courses Taught in Arabic	**2**
048GESAL4 **or** 048EVMOL1 **or** 048TCSOL2	Basic Pre-Rescue First Aid **or** Self-Expression Through Music **or** Theater and Self-Discovery	2
	HUMANITIES	**8**
064VALEL1	USJ Values in Daily Life	2
	Ethics	**2**
048EEECL1 **or** 048ETTPL1 **or** 048ETSBL1	Ethics, Energy, and Environment **or** Ethics and Technology **or** Ethics and Health	2
	Civic Engagement and Citizenship	**2**
048CITBL1 **or** 048DVQCL1 **or** 048SSDCL1	Active Citizenship: Strategy and Techniques **or** Law in Everyday Life **or** Sustainable Development	2
	Other Humanities Courses	**2**
048JSCPL1 **or** 048MAMPL1 **or** 048OCSCL1	Scientific Journalism **or** The World, Current Events, and Me **or** Origin of Scientific Concepts	2
	SOCIAL SCIENCES	**6**
	Professional Integration and/or Entrepreneurship	**2**

048ENTML6 **or** 048SJHPL2 **or** 048WRNBL2	Entrepreneurship **or** Successful Job Hunting **or** Work Ready Now	2
	Other Social Sciences Courses	**4**
048DBMML6 **or** 048SOLBL2 **or** 048EMIPL2 **or** 048TMMML2	Two courses to be chosen from the list below: Designing Business Models **or** Social Leadership **or** Sociology of Emotions **or** Time and Money Management	2
	QUANTITATIVE TECHNIQUES	**6**
048MTHBL1	Mathematics I	2
048MTHBL2	Mathematics II	4
	COMMUNICATION TECHNIQUES	**4**
048TCSPL2	Scientific Communication Techniques	4

SUGGESTED STUDY PLAN

Semester 1

Code	Course Name	Credits
048CSCCL1	General Chemistry I	6
048ICHCL1	General Chemistry II	4
048IICCL1	Introduction to the Chemical Industry	4
048MTHBL1	Mathematics I	2
048MCLPL1	Classical Mechanics	4
048MCAPL1	Advanced Classical Mechanics	2
048ETSBL1 048ETTPL1 048EEECL1 **or** 048DVQCL1 048SSDCL1 048CITBL1	Institution's Elective Courses, choose one of the following: Ethics and Health Ethics and Technology Ethics, Energy, and Environment **or** Law in Everyday Life Sustainable Development Active Citizenship: Strategy and Techniques	2
048OCSCL1 **or** 048JSCPL1 **or** 048MAMPL1	Institution's Elective Courses, choose one of the following: Origin of Scientific Concepts **or** Scientific Journalism **or** The World, Current Events, and Me	2
	Institution's Elective Course	2
	Open Elective Course	2
	Total	**30**

Semester 2

Code	Course Name	Credits
048CHECL2	Environmental Chemistry	4
048CHICL2	Inorganic Chemistry	6
048EELPL2	Electrostatics and Electrodynamics	4
048MGSPL2	Magnetostatics	4
048MTHBL2	Mathematics II	4
048TCSPL2	Scientific Communication Techniques	4
064VALEL1	USJ Values in Daily Life	2
	Open Elective Course	2
	Total	**30**

Semester 3

Code	Course Name	Credits
048STOCL3	Basics of Stereochemistry and Organic Chemistry	4
048BMABL3	Biochemistry of Macromolecules	6
048CINCL3	Chemical Kinetics	6
048PHACL3	Photochemistry and its Applications	2
048PRSCL3	Probability and Statistics	4
048TAICL3	Instrumental Analysis Techniques	4
048ETSBL1 048ETTPL1 048EEECL1 **or** 048DVQCL1 048SSDCL1 048CITBL1 **or** 048OCSCL1 048JSCPL1 048MAMPL1	Institution's Elective Course, choose one of the following: Ethics and Health Ethics and Technology Ethics, Energy, and Environment **or** Law in Everyday Life Sustainable Development Active Citizenship: Strategy and Techniques **or** Origin of Scientific Concepts Scientific Journalism The World, Current Events, and Me	2
	Open Elective Course	2
	Total	**30**

Semester 4

Code	Course Name	Credits
048COOCL4	Coordination Chemistry	4
048CO1CL4	Complementary Organic Chemistry I	2
048CO2CL4	Complementary Organic Chemistry II	2
048EFMBL4	Fundamental and Molecular Enzymology	6
048TDCCL4	Chemical Thermodynamics	8

048SJHPL2 **or** 048ENTML6 **or** 048WRNBL2	Institution's Elective Courses: Successful Job Hunting **or** Entrepreneurship **or** Work Ready Now	2
048DBMML6 048TMMML2 048SOLBL2 048EMIPL2	Institution's Elective Courses, choose two of the following: Designing Business Models Time and Money Management Social Leadership Sociology of Emotions	4
	Institution's Elective Course	2
	Total	**30**

Semester 5

Code	Course Name	Credits
048ANGLL5	English Level A	4
048OMCCL5	Organometallic Chemistry	4
048ESCCL5	Advanced Chemical Equilibria in Aqueous Solutions	8
048TRRCL5	Transposition and Rearrangement	6
048ELCCL5	Introduction to Electrochemistry	4
	Institution's Elective Courses	4
	Total	**30**

Semester 6

Code	Course Name	Credits
048ATOCL6	Atomic and Molecular Structure	8
048CPCCL6	Polymer Chemistry	6
048SPECL6	Spectroscopy	6
048SSCCL6	Synthesis Strategy	6
	Institution's Elective Courses	4
	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.

048ICHCL1 General Chemistry II 4 Cr.

This course aims to provide a deeper understanding of the basic concepts of quantum mechanics starting from various atomic models in order to better comprehend different types of chemical bonds, intramolecular bonds, and intermolecular forces.

048IICCL1 Introduction to the Chemical Industry 4 Cr.

This course aims to introduce students to the fields of industrial enterprise in general and specifically to the chemical industry. Concepts of industrial strategy and organization, as well as the fundamental role of the chemical industry as an economic driver, are presented. Basic principles of industrial organization and factory operation are discussed, along with unit processes.

048MTHBL1 Mathematics I 2 Cr.

This course introduces the main methodological tools necessary for the analysis and understanding of simple biological and chemical phenomena. It 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.

048MCLPL1 Classical Mechanics 4 Cr.

This course presents classical mechanics as a fundamental component of the science curriculum, developing expertise in solving problems related to point particles and rigid bodies. First-year students in Physics, Mathematics, and Chemistry will study Newtonian mechanics in depth, covering topics from point particle kinematics to accelerated reference frames.

048MCAPL1 Advanced Classical Mechanics 2 Cr.

This course is a follow-up to Classical Mechanics, dedicated to first-year Physics and Chemistry students. It addresses problems related to central forces, planetary motion, rocket physics, and particle collisions.

048BUICL1 Advanced Document and Data Management 2 Cr.

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

048CHECL2 Environmental Chemistry 4 Cr.

This course serves as an introduction to environmental sciences, particularly the chemical aspect, covering the following topics: atmosphere, water, soil, waste, and energy. Students will become familiar with basic concepts and understand the connections between different themes as well as global current issues (fossil fuel reserves, climate change, etc.), solutions and their constraints, and the current state of the environment in Lebanon. They will also be introduced, for the first time, to the concept of sustainable development and its resulting projects.

048CHICL2 Inorganic Chemistry 6 Cr.

This course involves studying, on one hand, the properties of all elements of the periodic table, all corresponding simple substances, and all compounds they can form with each other according to different types of bonds, and on the other hand, studying the crystallography of simple elements, ionic compounds, and alloys.

048EELPL2 Electrostatics and Electrodynamics 4 Cr.

This course provides a detailed study of electrostatic and electrodynamic phenomena. While mathematical formalism is used to determine the electrostatic field and potential, students will also uncover the physical meaning inherent in this formalism. The study of conductors in electrostatic equilibrium prepares students well to understand the causes of charge transport and to master concepts related to electric current: generators, receivers, resistors, complex circuits, etc.

048MGSPL2 Magnetostatics 4 Cr.

This course provides a detailed study of magnetostatic phenomena. While mathematical formalism is used to determine magnetic fields, students will also uncover the physical meaning inherent in this formalism. Laboratory practical sessions complement the level of application required through experimental manipulations.

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.

048TCSPL2 Scientific Communication Techniques 4 Cr.

This course is divided into two main parts. The first part focuses on public speaking techniques, where students learn to effectively present scientific concepts orally. The second part covers written communication techniques through the preparation of a scientific poster, where students learn to communicate the findings of bibliographic research visually and persuasively. This course aims to develop the scientific communication skills of students in Physics and Chemistry, with an emphasis on preparing and presenting scientific projects in different formats. Students will learn to effectively articulate complex scientific concepts, both in writing and orally, and to present their work convincingly. In addition to preparing a scientific poster, students will have the opportunity to refine their communication and public speaking skills through, among other activities, the preparation of a TED Talk.

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, is 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.

048CINCL3 Chemical Kinetics 6 Cr.

This course involves studying the rate and order of chemical reactions and the experimental methods for tracking reaction rates. It also covers the mechanisms of elementary and complex reactions. The final part of the course focuses on the different laws of catalysis and their industrial applications.

048PHACL3 Photochemistry and its Applications 2 Cr.

This course aims to introduce the basic concepts of photochemistry, study the photochemical reactions of organic compounds, and present the application of photochemical processes in various fields.

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 performing probability calculations and deciding between the use of parametric and non-parametric tests in order to compare the statistical mean of two populations or more.

048TAICL3 Instrumental Analysis Techniques 4 Cr.

This course is an introduction to chromatography and physico-chemical, separation, and spectrometric analysis techniques. The course covers the following topics: liquid phase chromatography, gas phase chromatography, and detection techniques such as UV-visible spectroscopy, fluorescence and phosphorescence, mass spectrometry, atomic absorption and molecular labeling, ion chromatography, electrophoresis, refractometry, inductively coupled plasma mass spectrometry (ICP-MS), and thin-layer chromatography (TLC).

048COOCL4 Coordination Chemistry 4 Cr.

This course consolidates the various models of chemical bonds existing in materials and the differences between ceramic, metallic, covalent materials, and those governed by weak Van der Waals interactions. It then builds on these concepts to explain in detail the lifting of degeneracies of valence orbitals when ligands approach.

048CO1CL4 Complementary Organic Chemistry I 2 Cr.

This course aims to deepen students' understanding of the reactivity of functionalized molecules. It covers the elements of symmetry, the chirality of molecules, and the pseudoasymmetry; the methods of enantiomer resolution; the mechanism of radical halogenations of alkanes and alkenes; the radical hydrobromination of alkenes; the radical allylic halogenation; the Internal Nucleophilic Substitution (SNi); the oxidation of alcohols; the epoxidation, dihydroxylation, oxidative cleavage and ozonolysis of alkenes; the oxidation of benzylic compounds; the hydroboration-oxidation of alkenes and alkynes; the Hückel aromaticity, the Möbius aromaticity, and the Electrophilic Aromatics Substitutions (EAS); the EAS of aromatic heterocycles; the aldolization reaction and the crotonization of aldols in acidic and basic medium; the Wittig reaction; the basicity of amines and amides; the imines and enamines. The focus will be on reaction mechanisms.

048CO2CL4 Complementary Organic Chemistry II 2 Cr.

This course aims to further develop students' knowledge of the reactivity of functionalized molecules beyond the basic notions already assimilated at this level. It covers basic organic chemistry reviews and delves into alcohols, ethers, and sulfur analogs, alkenes, alkynes, and conjugated π systems, carbonyl compounds, as well as heterocyclic compounds.

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 equilibrium between proteins and ligands. The Michaelis model, enzyme inhibition, and the analysis of pH and temperature effects on proteins and enzymes are explored, and the Monod-Wyman-Changeux model is used to describe allosteric enzymes. This course also provides detailed information on molecular aspects of enzymatic reactions. Enzyme kinetics for several substrates and their experimental verification are thoroughly 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 also presented at the end of the course.

048TDCCL4 Chemical Thermodynamics 8 Cr.

This course covers the general principles of thermodynamics, including physical thermodynamics and the first, second, and third laws. It then explores the basics of chemical thermodynamics by applying them to different types of chemical reactions and examining chemical equilibria and the thermodynamics of real gases.

048IAPCL4 Introduction to Python 2 Cr.

This course introduces computer programming, focusing on the Python language. It is particularly relevant for Chemistry students, especially those interested in industrial applications. Python is a flexible and general-purpose programming language, characterized by its object-oriented approach, dynamic interpretation, and abundance of free libraries and modules. It is a tool of choice for computational data analysis, and automation tasks, which are essential in many areas of chemistry.

048ANGLL5 English Level A 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.

048OMCCL5 Organometallic Chemistry 4 Cr.

This course covers stoichiometric organometallic chemistry and homogeneous catalysis with organometallic complexes. It explicitly deals with the preparation and reactivity of a wide array of organometallic nucleophiles alongside the regioselectivity, asymmetric induction, and diastereoselectivity of their reactions with electrophiles. The course also addresses the fundamentals of homogeneous organometallic catalysis, the ligands, the different types of complexes, and the fundamental reactions in catalytic organometallic chemistry. Following a comparative analysis between heterogeneous and homogeneous catalysis, the focus shifts to central reactions in homogeneous catalysis, particularly hydrogenation, oxidation, isomerization, coupling, carbonylation reactions, and reactions catalyzed by carbene complexes. Students will thoroughly discuss the catalytic cycles that explain these reactions, their scope, asymmetric variants, and their utility in synthesis.

048ESCCL5 Advanced Chemical Equilibria in Aqueous Solutions 8 Cr.

This course provides students with the tools to recognize and establish the laws governing all types of chemical equilibria in aqueous solutions separately, whether they are acid-base, redox, complexation, precipitation, or even combinations thereof in order to present real cases. Additionally, it enables students to master all theoretical treatments governing titrations using the aforementioned equilibria and the establishment of simulated theoretical evolution curves. Therefore, students will be able to analyze a given situation and effectively exploit conditional quantities to master processes and understand phenomena such as immunity or passivation corrosion.

048TRRCL5 Transposition and Rearrangement 6 Cr.

This course primarily focuses on rearrangement reactions. These reactions involve the migration of a hydrogen atom, a group of atoms, or σ and π bonds and can thus lead to dramatic modifications in a molecule's skeleton. This course explicitly covers pericyclic reactions, cycloadditions, electrocyclizations, and sigmatropic rearrangements, [1,2]-rearrangements, olefinations of carbonyl compounds, fragmentation reactions, and radical rearrangements. Orbital interpretations, reaction mechanisms, and various examples of applications help students acquire the logic necessary to explain the outcomes of these reactions and perceive their significance in synthesis. The corresponding lab work illustrates rearrangement reactions used in organic synthesis and allows students to put them into practice and become familiar with monitoring their progress.

048ELCCL5 Introduction to Electrochemistry 4 Cr.

This course examines chemical changes in materials caused by the passage of an electric current, and the reverse process in which a chemical reaction generates an electric current, as in a cell. It covers basic thermodynamics and kinetics concepts applied to electrochemical reactions and presents physicochemical properties of solutions to study the behavior and transport of electrically charged species. It also develops and applies mathematical representation models, defines and characterizes the double layer formed in an electrolytic medium, and applies these concepts to processes on electrodes, including electrochemical cells and mass transport.

048NANOL5 Nanotechnologies 4 Cr.

This course covers nanotechnologies as they are becoming increasingly present in our daily lives and represent a rapidly growing market. It 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, environmental applications, and optics. Current research topics in nanoscience are presented and discussed to understand the new properties sought at a very small scale.

048ATOCL6 Atomic and Molecular Structure 8 Cr.

This course applies quantum or wave mechanics to the structure of the atom and atomic and molecular orbitals. Its aim is to help students acquire a unified understanding of the various modern representations of the electronic structure of chemical entities (atoms, molecules, or crystals) and introduce commonly used calculation methods in various research fields.

048CPCCL6 Polymer Chemistry 6 Cr.

This course covers the science of macromolecular materials known as polymers. It aims to first introduce this young yet rich science, as evidenced by the development and impact of polymer materials in our daily lives. It presents basic knowledge about the composition, structure, and properties of macromolecules, identifies the application areas of polymers, and establishes links between molecular properties and the use of plastic materials. Furthermore, the two major principles of monomer assembly are presented, leading to polymers through step-growth polymerizations and the underlying theories, as well as chain polymerizations and the statistical and kinetic laws of evolution. In the final part, various radical polymerization processes are presented, focusing specifically on the most industrially used ones: suspension polymerization, known as bead polymerization, and emulsion polymerization, leading to colloidal latexes.

048SPECL6 Spectroscopy 6 Cr.

This course focuses on the identification of compounds with unknown structures. It begins by examining the physical state and constants of a sample, such as melting and boiling points, solubility, acidity or basicity, refractive index, and specific optical rotation. It then introduces spectral techniques to gather structural information: Infrared (IR) spectroscopy to detect functional groups, Proton Nuclear Magnetic Resonance (^{1}H-NMR) to determine the number, type, and environment of hydrogens, and Mass Spectrometry (MS) to reveal molecular weight, formula, and group arrangement. The course demonstrates how these techniques, combined with physical and chemical data, allow students to propose a structure for an unknown compound.

048SSCCL6 Synthesis Strategy 6 Cr.

This course strengthens students' knowledge of chemical reactions and trains them to apply this knowledge in designing the most efficient synthetic pathways for target molecules from simple, readily available starting materials. The topics cover techniques such as retrosynthetic analysis, regioselectivity, chemoselectivity, stereoselectivity, asymmetric synthesis, protection of functional groups, heterocycle synthesis, and an array of significant reactions in synthesis. Several total syntheses and their explanations are included in the course to allow students to practice the synthesis strategy. The corresponding lab work mainly consists of multistep syntheses, providing students with the practical knowledge required to assimilate and apply the organic synthesis literature.

048APCCL6 Practical Applications of Chemistry 4 Cr.

This course aims to develop autonomy, adaptability, and the ability to work in teams. To achieve this, the proposed activities should promote active student involvement through interaction with their peers. At the end of this course, students will be able to conduct bibliographic research on a chemical species, a chemical reaction, or an industrial process; they will become aware of the need to participate in technological and scientific monitoring; they will optimize operating conditions - choice of reagents, solvent, and possible catalyst - to increase the yield and kinetics of a synthesis. They will acquire the knowledge and attitudes to achieve energy savings, to use substitute raw materials derived from agri-resources, to explore solvent-free synthesis pathways (or with less harmful solvents); recycling, waste valorization, and the reduction of hazardous environmental releases are essential aspects addressed in this course. Part of this course aims to identify the differences between a synthesis conducted in the laboratory and its implementation on a pilot scale. This scale change also helps to understand the optimization steps of an industrial process.

435LALML2 Arabic Language and the Media 2 Cr.

This course allows students to explore the Arabic language and its culture through diverse media forms, including journalism and advertising in visual, audio, and written formats. It develops practical linguistic, oral, and written skills.

435LALAL2 Arabic Language and the Arts 2 Cr.

This course allows students to explore the Arabic language and its culture through various art forms, including painting, calligraphy, and Arabic ornamentation. It develops practical linguistic, oral, and written skills.

048GESAL4 Basic Pre-Rescue First Aid 2 Cr.

This course focuses on recognizing emergencies, identifying appropriate first aid procedures, and providing initial care.

048TCSOL2 Theater and Self-Discovery 2 Cr.

This course is aimed at students who wish to learn acting techniques in a recreational and enjoyable setting. Sessions focus on 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 course aims to help students master and enhance their presence on stage and their interaction with the audience for any type of performance: lectures, seminars, etc. Practice is conducted individually and collectively on stage, combining the enjoyment and discipline of performance. The teaching approach emphasizes the body and voice as the actor's primary tools and encourages creativity in responding to scenarios and delivering text in diverse ways.

064VALEL1 USJ Values in Daily Life 2 Cr.

This course aims to raise students' awareness of the core values of the Saint Joseph University of Beirut (USJ) and encourage them to integrate these values into their personal, interpersonal, and professional lives. It engages them in a critical reflection on how the values outlined in the USJ Charter can influence their behaviors, actions, and decisions in addressing contemporary challenges. Students will also become aware of global issues and ethical responsibilities, preparing them to contribute positively to building a better society.

048EVMOL1 Self-Expression Through Music 2 Cr.

This course engages students in selecting songs in Arabic, French, English, and Italian to develop a group project that inspires self-expression through music or original text.

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 are also 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.

048CITBL1 Active Citizenship: Strategy and Techniques 2 Cr.

This course enables students to experience citizenship and explore various forms of civic practices in Lebanon and around the world.

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, widely discussed news, 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.

048DBMML6 Designing Business Models 2 Cr.

This course introduces Design Thinking, a framework for solving business problems and creating successful products. It covers the five iterative phases of the process:

- Discovery: gathering information around stakeholders, user pain points, business requirements, etc.
- Definition: re-framing the problem to be broad enough to encourage out-of-the-box thinking, while remaining focused enough to meet business needs.
- Ideation: exploring different ways to address the problem and meeting the user's needs.
- Prototype: producing a low-fidelity version of the product/service/etc. that doesn't require imagination to visualize the solution.
- Testing: gathering feedback from target users on the prototype to understand what works and what needs to be modified.

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.

048ENTML6 Entrepreneurship 2 Cr.

This course introduces the fundamentals of entrepreneurship in a rapidly evolving work environment, where traditional career paths are being reshaped by innovation and technology. It emphasizes the development of an entrepreneurial mindset and provides students with the education and support to explore alternative career paths beyond the traditional trajectory.

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.

048SJHPL2 Successful Job Hunting 2 Cr.

The course introduces students to professional life and its demands in terms of personal development and technical knowledge.
It covers:

1- Responding to a job offer (application e-mail, cover letter, CV)
2- Passing 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.)

048TMMML2 Time and Money Management 2 Cr.

This 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.

048WRNBL2 Work Ready Now 2 Cr.

The Work Ready Now program provides 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.

048SOLBL2 Social Leadership 2 Cr.

This course explores social leadership, an emotional and empathetic leadership style that emphasizes connection, collaboration, and communication. It covers how leaders cultivate strong relationships, trust, care, and respect within teams to foster an open and positive work environment. The course highlights the use of emotional intelligence and interpersonal skills to influence others, rather than relying solely on position or title, enhancing effectiveness in today's workplace where employees seek meaning and purpose in their work.

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, through examples, this course emphasizes the correct use of words and legal terminology.

048OCSCL1 Origin of Scientific Concepts 2 Cr.

This course introduces students to the process of conducting reflexive analysis on the origins and development of scientific concepts as well as the history of scientific disciplines. It aims to develop their critical thinking skills in relation to the examination of the current connections among epistemology, philosophy of science, 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.

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.

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.