BACHELOR IN MATHEMATICS

Main Language of Instruction:
French ☑ English ○ Arabic ○

Campus Where The Program Is Offered: CST

OBJECTIVES

At the heart of the mathematical program provided at the Saint Joseph University of Beirut (USJ), the Bachelor in Mathematics stands as the initial foundation, offering an essential gateway to a thorough understanding of this science. Mathematics plays a crucial role in understanding the functioning of the world and in the advancement of all scientific disciplines. Researchers rely on this discipline to drive technological innovations that revolutionize our daily reality, whether in the field of the internet, aviation, rockets, or even electronic transactions.
The Bachelor in Mathematics, offered at the Baccalaureate+3 level at USJ, provides students with a solid foundation in this discipline, preparing them for advanced studies in various fields that require mathematical expertise. Beyond secondary education, holders of this degree have diverse prospects. Depending on their specialization in a master's program, they can pursue careers related to modeling and solving scientific problems, become actuaries, specialists in risk engineering, or even embrace the rapidly expanding field of data science, bringing their expertise as consultants in various professional sectors. The USJ Bachelor in Mathematics thus opens the door to a multitude of professional opportunities, shaping diverse and stimulating paths for students passionate about this fundamental discipline.

The Bachelor in Mathematics aims to train students to:
- Become entrepreneurs, consultants, and innovators.
- Pursue further studies in mathematics, applied mathematics, actuarial science, data science, engineering, etc., at USJ or at internationally renowned universities.
- Become teachers and coordinators of mathematics and computer science.

PROGRAM LEARNING OUTCOMES (COMPETENCIES)

- Engage in rigor ous mathematical reasoning.
- Implement techniques for solving deterministic and probabilistic problems.
- Model a simple problem using mathematical language.
- Pursue higher education in mathematics as well as in related disciplines or engineering sciences.

PROGRAM REQUIREMENTS

180 credits: Required courses (146 credits), Institution's elective courses (28 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 (146 Cr.)
Algorithm (6 Cr.), Arithmetic (4 Cr.), Bilinear Algebra (6 Cr.), Calculus I (4 Cr.), Calculus II (2 Cr.), Classical Mechanics (4 Cr.), Complex Analysis (6 Cr.), Differential Calculus (6 Cr.), Differential Equations and Approximation Schemes (6 Cr.), Excel and VBA (2 Cr.), Financial Mathematics I (2 Cr.), Financial Mathematics II (2 Cr.), Foundations of Mathematics (4 Cr.), Functions I (4 Cr.), Functions II (2 Cr.), Groups (2 Cr.), Geometric Algebra (4 Cr.), Inductive Statistics (6 Cr.), Integration and Measure Theory (6 Cr.), Linear Algebra (4 Cr.), Linear Systems and Diagonalization of Endomorphisms (2 Cr.), Matrix Analysis (6 Cr.), Metric Topology (4 Cr.), Numerical Analysis (4 Cr.), Numerical Computation Software: MATLAB (2 Cr.), Object-Oriented Programming and C++ (6 Cr.), Probability Computation (4 Cr.), Probability Theory (6 Cr.), Python (4 Cr.), Series (4 Cr.), Topological Spaces (6 Cr.), Vector Calculus (6 Cr.), English Level A (4 Cr.), USJ Values in Daily Life (2 Cr.), Communication Tools and Techniques (4 Cr.).

Institution's Elective Courses (28 Cr.)
4 Courses to be chosen from the list: Economics and Finance (4 Cr.), Electromagnetism (4 Cr.), Electrostatics and Electrodynamics (4 Cr.), Foundations of Data Science (4 Cr.), Artificial Intelligence (4 Cr.), Introduction to Actuarial Science (4 Cr.).
6 Courses to be chosen from the list: Ethics, Energy, and Environment (2 Cr.), Ethics and Technology (2 Cr.), Ethics and Health (2 Cr.), Active Citizenship: Strategy and Techniques (2 Cr.), Law in Everyday Life (2 Cr.), Sustainable Development (2 Cr.), Scientific Journalism (2 Cr.), The World, Current Events, and Me (2 Cr.), Origin of Scientific Concepts (2 Cr.), Entrepreneurship (2 Cr.), Successful Job Hunting (2 Cr.), Work Ready Now (2 Cr.), Designing Business Models (2 Cr.), Social Leadership (2 Cr.), Sociology of Emotions (2 Cr.), Time and Money Management (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 **oror** 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**
048STIML4	Inductive Statistics	6
	COMMUNICATION TECHNIQUES	**4**
048TOCML6	Communication Tools and Techniques	4

SUGGESTED STUDY PLAN

Semester 1

Code	Course Name	Credits
048ALGML1	Algorithm	6
048BANML1	Calculus I	4
048CANML1	Calculus II	2
048MCLPL1	Classical Mechanics	4
048FOMML1	Foundations of Mathematics	4
048EEECL1 048ETTPL1 048ETSBL1 048CITBL1 048DVQCL2 048SSDCL1 048JSCPL1 048MAMPL1 048OCSCL2	Institution's Elective Courses, to be chosen from the list below: Ethics, Energy, and Environment Ethics and Technology Ethics and Health Active Citizenship: Strategy and Techniques Law in Everyday Life Sustainable Development Scientific Journalism The World, Current Events, and Me Origin of Scientific Concepts	2
	Institution's Elective Courses	4
	Open Elective Courses	4
	Total	**30**

Semester 2

Code	Course Name	Credits
048ARIML2	Arithmetic	4
048EVBML2	Excel and VBA	2
048FONML2	Functions I	4
048FOAML2	Functions II	2
048GRPML2	Groups	2
048ALLML2	Linear Algebra	4
048SLRML2	Linear Systems and Diagonalization of Endomorphisms	2
048PYTML2	Python	4
064VALEL1	USJ Values in Daily Life	2
048ENTML6 048SJHPL2 048WRNBL2 048DBMML6 048SOLBL2 048EMIPL2 048TMMML2	Institution's Elective Course, to be chosen from the list below: Entrepreneurship Successful Job Hunting Work Ready Now Designing Business Models Social Leadership Sociology of Emotions Time and Money Management	2
	Open Elective Course	2
	Total	**30**

Semester 3

Code	Course Name	Credits
048ALBML3	Bilinear Algebra	6
048TOMML3	Metric Topology	4
048LCNML3	Numerical Computation Software: MATLAB	2
048CAPML3	Probability Computation	4
048ANVML3	Vector Calculus	6
048EEECL1 048ETTPL1 048ETSBL1 048CITBL1 048DVQCL2 048SSDCL1 048JSCPL1 048MAMPL1 048OCSCL2	Institution's Elective Courses, two to be chosen from the list below: Ethics, Energy, and Environment Ethics and Technology Ethics and Health Active Citizenship: Strategy and Techniques Law in Everyday Life Sustainable Development Scientific Journalism The World, Current Events, and Me Origin of Scientific Concepts	4
	Institution's Elective Courses	4
	Total	**30**

Semester 4

Code	Course Name	Credits
048AGEML4	Geometric Algebra	4
048STIML4	Inductive Statistics	6
048ANNML4	Numerical Analysis	4
026PROOL4	Object-Oriented Programming and C++	6
048ETSML4	Series	4
048ENTML6 048SJHPL2 048WRNBL2 048DBMML6 048SOLBL2 048EMIPL2 048TMMML2	Institution's Elective Course, to be chosen from the list below: Entrepreneurship Successful Job Hunting Work Ready Now Designing Business Models Social Leadership Sociology of Emotions Time and Money Management	2
	Institution's Elective Courses	4
	Total	**30**

Semester 5

Code	Course Name	Credits
048ANCML5	Complex Analysis	6
048ANGLL5	English Level A	4
048FM1ML5	Financial Mathematics I	2
048ITMML5	Integration and Measure Theory	6
048AMAML5	Matrix Analysis	6
048ESTML5	Topological Spaces	6
	Total	**30**

Semester 6

Code	Course Name	Credits
048TOCML6	Communication Tools and Techniques	4
048CADML6	Differential Calculus	6
048EDAML6	Differential Equations and Approximation Schemes	6
048FM2ML6	Financial Mathematics II	2
048THPML6	Probability Theory	6
048ENTML6 048SJHPL2 048WRNBL2 048DBMML6 048SOLBL2 048EMIPL2 048TMMML2	Institution's Elective Course, to be chosen from the list below: Entrepreneurship Successful Job Hunting Work Ready Now Designing Business Models Social Leadership Sociology of Emotions Time and Money Management	2
	Institution's Elective Courses	4
	Total	**30**

COURSE DESCRIPTION

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.

048ALGML1 Algorithm 6 Cr.

This course introduces students to programming through algorithms, a generic language that addresses problems with a sequence of basic instructions and forms the foundation of programming languages such as C++ and Python. It teaches students to construct pseudo-codes, including algorithms and flowcharts.

435LALAL2 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.

435LALML2 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.

048ARIML2 Arithmetic 4 Cr.

By the end of this course, students will be able to deal with elementary algebraic structures and to solve elementary arithmetic problems in the ring of integers and the ring of polynomials with coefficients in a field. They will also examine the existence of some inherent structure explaining the analogy between the arithmetic properties in both rings (Gauss's lemma, Bézout's identity, Euclid's theorem, Fundamental Theorem of Arithmetic, etc.).

026INARL3 Artificial Intelligence 4 Cr.

This course covers the following themes: study of intelligent agents: problem solving, breadth-first and depth-first search algorithms, game programming: minimax, expectimax, knowledge and reasoning, planning, learning, natural language processing, vision, robotics, inference mechanisms, Bayesian networks, Markov processes, reinforcement learning and its algorithms.

048GESAL4 Basic Pre-Rescue First Aid 2 Cr.

This course enables students to recognize emergency situations, identify first aid procedures, and initiate first aid care.

048ALBML3 Bilinear Algebra 6 Cr.

By the end of this course, students will be able to reduce matrices and endomorphisms (diagonalization, triangularization) and apply these techniques in Algebra and Analysis, such as in solving linear differential systems. They will understand the dual space and its properties: dual basis, orthogonality and transposition. They will also be able to define bilinear symmetric forms and quadratic forms, and will be familiar with their properties and applications, such as orthogonal bases and Gauss decomposition.

048BANML1 Calculus I 4 Cr.

This course aims to familiarize students with the elementary and basic notations and properties of analysis starting with the real numbers, complex numbers and sequences properties. They will also learn how to study the continuity and derivability of real-valued functions.

048CANML1 Calculus II 2 Cr.

This course allows students to strengthen and deepen their knowledge of basic analysis by providing theoretical tools necessary for its formation.

048MCLPL1 Classical Mechanics 4 Cr.

This course is one of the cornerstones of the program at the Faculty of Science as it allows for the development of expertise in addressing a variety of problems related to point particles and rigid bodies. First-year students in Physics, Mathematics, and Chemistry will engage in an in-depth study of Newtonian mechanics, covering the description of point particle kinematics to that of accelerated reference frames.

048TOCML6 Communication Tools and Techniques 4 Cr.

This course is divided into two parts: in the first part, the course introduces students to the art and science of preparing an engaging visual presentation.
The second part enables students to acquire or enhance their communication skills, whether in academic or professional settings. It provides basic theoretical knowledge and strategic communication techniques to handle any situation of interaction between individuals or groups. It also enables students to strategically understand the range of communication tools to create a communication strategy tailored to the context and audience. This interactive course aims to shape the identity of young students as speakers or communicators capable of influencing their environment, notably ensuring success in their profession.

048ANCML5 Complex Analysis 6 Cr.

This course covers complex functions and integrate them along curves. Students will be able to determine holomorphic functions and the isolated singularities of meromorphic functions. They will learn the main theorems related to line integration such as the Cauchy Integral Formula, Cauchy's fundamental theorem, the residue theorem and its applications, mainly for integrating real functions. They will also learn how to use the analytic continuation principle and the maximum principle.

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.

048CADML6 Differential Calculus 6 Cr.

This course aims to familiarize students with the differentiability of functions defined on normed spaces. They will be able to calculate the maxima and minima of these functions with or without constraints and to solve equations locally.

048EDAML6 Differential Equations and Approximation Schemes 6 Cr.

The course aims to provide the students with analytical and numerical techniques for the Cauchy-Lipschitz problems. Students will be able to show the existence and uniqueness of the solution and to approximate it by using Runge-Kutta and multisteps methods. Furthermore, it allows them to use the finite-difference methods to approximate the solution of Cauchy Problem.

048ECFML1 Economics and Finance 4 Cr.

This course aims to make students aware of the economic and financial environment in which they operate. The "Finance" part covers several chapters. It starts with general definitions, then elaborates on the concept of patrimony and then moves on to the budget: the personal budget and how the state budget works. The notions of "loans," "savings," "investments" and "taxation" are presented to finally move to different types of taxes that affect taxpayers.
The "Economy" part is summed up by examining the market forces that make the economy run in order to understand the mechanism of the economic machine through growth, recession, depression and debates to revive the economy. An update will be needed to take a look at public and private stakeholders in the economy, their influences and their decisions.
Practical cases are presented to lighten the theoretical part. The current major issues affecting the Lebanese economic and financial situation are discussed at different stages.

048EMGPL3 Electromagnetism 4 Cr.

In this course, second-year undergraduate students, capable of using advanced mathematical techniques, will delve into an advanced study of concepts related to electric and magnetic fields. After developing the local equations of electrostatics and electromagnetism, students are led to establish Maxwell's equations in a vacuum. Furthermore, the study of different types of capacitors and their operation, as well as the study of coils and their mutual influences, enable students to undertake a detailed study of RLC circuits in slowly varying time regimes.

048EELPL2 Electrostatics and Electrodynamics 4 Cr.

This course provides a detailed study of electrostatic and electrodynamic phenomena. While mathematical formalism is used to determine 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.

048MAEML1 Elementary Mathematics 2 Cr.

This course presents the main methodological tools necessary in analysis and algebra of the undergraduate program. This course consists of theory without proofs and exercises of direct application.
Students who have completed this course will be able, on the one hand, to handle sets, complex numbers, and sequences; on the other hand, they will be able to study various elements of a curve, including calculating limits and derivatives and analyzing the direction of variations. They will also be able to perform the integral calculation of functions over an interval.

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.

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.

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.

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.

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.

048EVBML2 Excel and VBA 2 Cr.

The VBA (Visual Basic for Applications) language allows users to customize beyond what is normally available with Microsoft Office host applications (Word, Excel, etc.). This course allows students to discover the VBA language, to program in VBA and to write macros. Students will be able to develop programs to perform automated and repetitive tasks on spreadsheets.

048FM1ML5 Financial Mathematics I 2 Cr.

This course aims to give an efficient introduction to the financial world through learning the fundamental mathematics behind it. It introduces students to the concept of assets and liabilities in a firm and applies the financial theory to these components and to the market in order to help make knowledgeable decisions regarding funds, investments and insurance.
The plan is aligned with the Society of Actuaries FM exam. After taking this course, students will be equipped with the official content of the first part of this exam. In addition, the course is mostly based on real-case applications making it very useful for various professional fields.
Financial mathematics is an essential tool for every person handling corporate figures, balance sheets, investments or funds. This course provides students with the needed methodologies and approaches permitting the analysis of cashflows, investments, financial products in order to make decisions regarding capital allocations, insurance choices, banking plans, etc.
Throughout the course, students will begin by learning the basic terminology and key components of financial calculus then gradually learn how to apply these in financial problems and situations.

048FM2ML6 Financial Mathematics II 2 Cr.

This course continues from Financial Mathematics I and focuses on the applied aspects of financial mathematics in insurance, banking, and other companies. Aligned with the SOA FM exam, it emphasizes applying exam concepts to company figures and investment strategy analysis. Centered on real-case applications, mainly using Excel with real datasets, it provides practical skills for various job fields. The course covers interest rate implications, maturity and liquidity gaps, and asset-liability management through duration and weighting of financial instruments. It also addresses stock price simulations and relates discussions to real financial crises and portfolio gains and losses.

048FDSML3 Foundations of Data Science 4 Cr.

This course presents the profession of Data Scientist with its basic foundations in mathematics, statistics and computer science. It introduces data and its sources as well as the evolution of its analysis and the transition from Business Intelligence (BI) to predictive analysis.

048FOMML1 Foundations of Mathematics 4 Cr.

This course introduces students to the standard notations, reasoning methods, and objects used in modern mathematics. It enables them to manipulate numbers, functions, sets, binary relations, and quotient spaces with ease.

048FONML2 Functions I 4 Cr.

This course allows students to locally compare functions using limit expansion. They also will be able to integrate functions in any interval and to solve differential equations of first and second order. This course also discusses the basic properties of functions with several variables.

048FOAML2 Functions II 2 Cr.

This course allows students to strengthen and deepen their knowledge in terms of limited expansions, integrals, differential equations and functions of several variables.

048AGEML4 Geometric Algebra 4 Cr.

This course, offered in the Bachelor in Mathematics, serves as a foundational subject for other courses in the curriculum and for the Master's program in the same discipline. It continues from Bilinear Algebra, introducing concepts such as scalar products as symmetric bilinear forms and linking geometric notions like projection and symmetry to their algebraic representations. Students will learn to orthonormalize a basis using the Gram-Schmidt process, understand affine spaces and hyperplanes, identify and classify isometries and orthogonal matrices, and calculate the mixed product in oriented 2- and 3-dimensional spaces. The course also covers the development of Fourier series, their main convergence properties, and Parseval's equality.

048GRPML2 Groups 2 Cr.

This course is an introduction to Group theory, one of the oldest branches of modern algebra. It has become a crucial tool in uncovering hidden symmetries of the world. Students who have enrolled in this course can manipulate abstract algebraic notions and will be able to conduct an abstract algebraic reasoning.

048STIML4 Inductive Statistics 6 Cr.

This course provides procedures for extrapolating the behavior of a population from a sample. It begins with a review of common probability distributions (Student's t, Chi-square, Fisher). It then covers point estimates of parameters using the method of moments, as well as confidence intervals. A significant portion of the course is dedicated to statistical hypothesis testing, including tests on proportions, means, variances, and Chi-squared tests. By the end of the course, students will be able to analyze the properties of statistical estimators and use statistical tests to estimate unknown population parameters.

048ITMML5 Integration and Measure Theory 6 Cr.

This course aims to familiarize students with the procedure of integrating measurable functions with respect to positive measures. Students will learn to apply various convergence theorems, such as the Beppo-Levi and Lebesgue's Dominated Convergence Theorem, and to study the continuity and differentiability of parameter-dependent integrals. The course also discusses the structure of L^p spaces and relevant inequalities, including Hölder's and Minkowski's inequalities. Additionally, the construction of product measurable spaces and Fubini's Theorem will be detailed. By the end of the course, students will be proficient in these advanced concepts of measure theory and integration.

048IASML4 Introduction to Actuarial Science 4 Cr.

This course examines the unique aspects of the insurance market and its business cycles. It explores different areas of insurance operations, including legal forms, company approval, regulation and sustainability, and insurance product distribution. The course also introduces students to the actuarial profession, presenting various roles and their daily functions.

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.

048ALLML2 Linear Algebra 4 Cr.

This course is offered in the first year of the Bachelor in Mathematics as a base subject for the other subjects of the curriculum and for that of the masters in the same discipline.
It is an essential prerequisite for various subjects such as Bilinear Algebra, Numerical Analysis, Numerical Methods, Differential Calculus and Complex Analysis. It is also an important course for further studies in mathematics.
Students will manipulate matrices and are able to calculate the determinant and the rank of a matrix and will know their properties. They will be able to calculate the inverse of a matrix when it is invertible and diagonalize it when it is diagonalizable. They will also learn the different properties of vector spaces, especially in finite dimension and will be able to handle linear applications.

048SLRML2 Linear Systems and Diagonalization of Endomorphisms 2 Cr.

By the end of this course, students will be able to identify the different properties of linear systems and will solve them using different techniques. They will also check if an endomorphism is diagonalizable and will perform its diagonalization.

048AMAML5 Matrix Analysis 6 Cr.

The course aims to provide a set of direct and iterative numerical methods for solving linear systems of equations.

048TOMML3 Metric Topology 4 Cr.

This course aims to familiarize students with the notion of metric topology. They will distinguish norms and metrics in order to study geometries of different metric spaces and to construct spaces.

048ANNML4 Numerical Analysis 4 Cr.

This course familiarizes students with the concept of numerical analysis. They will learn how to approach the solution of non-linear systems and to interpolate data with polynomials. They will be able to use the least square method and to approximate the derivative and the integral of functions. Finally, they will learn how to approximate the solutions of differential systems. They will also be able to estimate the error between the exact solution and the approximated one in all cases.

048LCNML3 Numerical Computation Software: MATLAB 2 Cr.

This course introduces MATLAB, a numerical computation software that enables matrix manipulation, data and curve visualization, algorithm implementation, and user interface creation through its interactive programming language. It highlights MATLAB's applications across engineering, science, and economics in both industrial and research contexts.

026PROOL4 Object-Oriented Programming and C++ 6 Cr.

This course introduces object-oriented programming in C++. It covers the structure of a C++ program, types and variables, expressions and instructions, control instructions (conditionals, loops), composite types, functions and parameters, objects (encapsulation and abstraction, inheritance, polymorphism), input/output, streams, error and exception handling.

048OCSCL1 Origin of Scientific Concepts 2 Cr.

This course introduces 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.

048CAPML3 Probability Computation 4 Cr.

This course equips students with techniques to analyze and explain random phenomena. It starts with enumerative combinatorics as a foundation for probability calculations. The concept of independent events is then discussed, followed by a detailed study of random variables and key probability distributions (Bernoulli, binomial, Poisson, geometric, hypergeometric, uniform, Gaussian, exponential). The course concludes with the weak law of large numbers and the central limit theorem, preparing students for further studies in statistics.

048THPML6 Probability Theory 6 Cr.

This course offers a comprehensive study of random variables and key convergence theorems. Students will learn to manipulate random variables by determining their distributions, calculating moments, and analyzing independence. They will explore the convergence of sequences of random variables, focusing on concepts such as almost sure convergence, convergence in probability, and convergence in distribution. The course also covers the application of the strong law of large numbers and the central limit theorem, enabling students to understand and predict the long-term behavior of random processes. By the end of the course, students will be equipped with the skills necessary to analyze complex probabilistic systems and prepare for advanced studies in probability and statistics.

048PYTML2 Python 4 Cr.

This course provides students with a solid understanding of the fundamentals of Python, enabling them to create programs ranging from simple to complex. Students will learn to manipulate variables, control program flow with loops and tests, and use external modules for specific tasks. By the end of the course, students will be capable of developing functional Python applications and solving practical problems using the language.

048JSCPL1 Scientific Journalism 2 Cr.

This course is designed to teach students the basic techniques and rules governing journalistic writing. By 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.

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.

048ETSML4 Series 4 Cr.

By the end of this course, students will be able, on the one hand, to study the validity of the parameter-dependent integral of functions and calculate those integrals.
On the other hand, they will get acquainted with the notion of infinite sum of terms and will examine the convergence of the series and distinguish between different types of convergence of sequences and series of functions. They will also be capable of developing functions by means of power series, after having examined the necessary conditions.

048SPAOL1 Simulation of Piloting and Civil Aviation I 2 Cr.

This course provides an instructional introduction to single-engine aircraft operation using digital simulations, without claiming to be a formal pilot training program. It introduces basic concepts of navigation and standards for various European regions in a simplified manner. Students will learn to use airport charts for takeoffs and landings. The course aims to enable students to start a training aircraft, perform a proper takeoff, navigate according to Visual Flight Rules, and prepare for a safe landing.

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 trust, care, and respect within teams to foster an open and positive work environment. Students will learn to leverage 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.
By the end of 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.

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.)

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.

048TSCOL2 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.

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.

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.

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.

048ESTML5 Topological Spaces 6 Cr.

This course enables students to distinguish geometrical properties of different spaces and construct such spaces. They will also be able to study the continuity of functions and to manipulate simple topological invariants such as compactness, connectedness and completion of metric spaces.

048ANVML3 Vector Calculus 6 Cr.

This course covers differentiation and integration of vector fields, partial differentiation and multiple integration. This branch of mathematics plays an important role in differential geometry and in the study of partial differential equations and is used extensively in physics and engineering. By the end of this course, students will be able to study differentiation of functions involving multiple variables. They will also perform classical calculations of double and triple integrals, line and surface integrals and apply Ostogradsky's and Stokes formulas.

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.