Science, Computer Science and Mathematics (200.C1)

Pre-University Program

College Education

2021 Version

Québec

DÉFINITION DU PROGRAMME D'ÉTUDES

Titre du programme	Sciences, informatique et mathématique
Type de programme	Programme d'études préuniversitaires
Code et version du programme	200.C1 (2021)
Type de sanction	Diplôme d'études collégiales
Conditions particulières d'admission	Chimie de la 5e secondaire
	Mathématique, séquence *Technico-sciences* ou *Sciences naturelles*, de la 5e secondaire
	Physique de la 5e secondaire

Nombre d'unités — 58 ⅔
  Formation générale — 26 ⅔
  Formation spécifique — 32

Nombre de périodes d'enseignement — 1560
  Formation générale — 660
  Formation spécifique — 900

Disciplines
- Chimie
- Informatique
- Mathématique
- Physique

Session et année d'entrée en vigueur — Implantation facultative : Automne 2022
Implantation obligatoire : Automne 2024

APPROBATION

Recommandations :

_____ 2021-12-15
Sous-ministre adjoint au développement Date
et au soutien des réseaux

_____ 2021-12-15
Sous-ministre Date

Approbation de la ministre : _____ 2022-01-14
Date

DEFINITION OF THE PROGRAM

Program title	Science, Computer Science and Mathematics
Type of program	Pre-university program
Program code and version	200.C1 (2021)
Type of certification	Diploma of College Studies
Special conditions for admission	Secondary V Chemistry Secondary V Mathematics: Technical and Scientific option or Science option Secondary V Physics
Number of credits	58 ⅔
General education component Program-specific component	26 ⅔ 32
Number of periods of instruction	1560
General education component Program-specific component	660 900
Fields of study	• Chemistry • Computer science • Mathematics • Physics
Term and year entering into effect	Optional implementation: Fall 2022 Compulsory implementation: Fall 2024

Table of Contents

College-Level Programs

In Québec, college is the next stage after the compulsory years of schooling (elementary and secondary school). College graduates enter the labour market directly or proceed to university studies. The Ministère of Higher Education establishes the programs of study, while individual colleges ensure their implementation.

A college-level program provides the frame of reference within which the students acquire designated competencies in order to qualify for a profession or to pursue their studies. For the teachers, the program outlines learning objectives and defines the scope of their application.

The following figure illustrates the relationships among the elements of a college-level program, going from the general to the specific:

- Aims of college education
- Common competencies
- Goals of the program-specific component and the general education component
- Objectives and standards of the program-specific component and the general education component

Figure 1 – Elements of a College-Level Program

Programs leading to the Diploma of College Studies (DCS) include two main components: a general education component and a program-specific component. Both these components contribute to a student's education, as the knowledge, skills and attitudes imparted in one are emphasized and applied in the other, whenever possible. General education is an integral part of each program and, when coupled with the program-specific component as part of an integrated approach, fosters the development of the competencies required by all programs.

All college-level programs are characterized by three educational aims and five common competencies.

Aims of College Education

Educational aims guide the actions of those involved in the students' education. They facilitate the program-based approach by establishing the outcomes expected of students at the end of their college studies.

To educate students to live responsibly in society

At the personal level, students show they are engaged in their learning. They demonstrate rigour and perseverance as well as skills enabling them to analyze, synthesize and carry out research. At the professional level, they draw on their ability to apply their knowledge, skills and attitudes and to adapt to new situations. In the realm of social and civic life, students assume their role as informed and responsible citizens by adopting desirable attitudes and behaviours. They show evidence of open-mindedness and a sense of community in their dealings with others.

To help students integrate cultural knowledge into their studies

Students continue to enhance their personal culture and are able to appreciate various forms of cultural expression. Through their studies, they have become familiar with cultural productions. They can interpret the meaning and assess the value of these productions and are aware of the role they themselves play in the expression of culture. The development of their critical judgment and social conscience and the consolidation of their historical references have broadened their cultural horizons. Students recognize the diversity of social and cultural realities and appreciate the breadth and wealth of Québec's culture. Lastly, they apply their cultural knowledge by making connections among events occurring around them and by being involved in cultural, artistic, sports, technical or scientific activities.

To help students master language as a tool for thought, communication and openness to the world

Students understand and produce various forms of complex discourse in different situations. They are able to read and write independently at an advanced skill level. Their mastery of language allows them to engage in independent reflection, to know where they stand relative to various forms of discourse, and to express themselves in a structured, rational and precise manner. When faced with different communication situations, students are able to express their world view and identity. Language mastery also helps students be receptive to the dissemination of a broad range of knowledge. It allows them to share points of view and improve their communication skills in both the language of instruction and a second language.

Common Competencies of College Education

Common competencies are associated with the aims of college education. They help to ensure students are adequately prepared for personal and professional life.

Solve problems

Students can identify a problem and analyze its elements. They can list and classify possible solutions and implement the one they feel is most effective. They reflect on their approach, assess the appropriateness of the chosen solution and determine whether it can be applied in other situations.

Use creativity

Students discover new possibilities by juxtaposing, combining and reorganizing existing concepts, and by using ideas, strategies and techniques in new ways. Students are open to new ideas and different ways of doing things, while assessing their effectiveness.

Adapt to new situations

When faced with a new situation, students are both open and critical. After analyzing the situation at hand, they identify and test ways of dealing with it. To adapt to a world that is constantly changing, students work in teams and show concern for keeping their knowledge up to date.

Exercise a sense of responsibility

Students assume their role as responsible citizens and act in accordance with socially and democratically desirable attitudes and behaviours. They act ethically and with integrity, exercise critical judgment and are fully engaged, personally, socially and professionally. Independent and organized, they respect their commitments.

Communicate

Students deliver a coherent message adapted to each situation. They are able to listen and to structure their thoughts in order to formulate a clear message. They rely on a variety of communication strategies and use information and communications technologies. They evaluate the impact of their communication and review their strategies, as needed.

Implementation of College-Level Programs

Each college determines the ways in which the educational aims, common competencies, goals, objectives and standards are implemented. This does not mean that students in a college must follow common courses. Each course may contribute to the full or partial achievement of these elements. The important thing is that all of these elements are taken into consideration in one or more courses and that they become specific focuses of teaching and learning, since they have been recognized as essential to the practice of a profession or to the pursuit of university studies in a given discipline.

The *Science, Computer Science and Mathematics* Program

The *Science, Computer Science and Mathematics* program was designed in keeping with the *Cadre général d'élaboration des programmes d'études préuniversitaires*, the framework for the development of pre-university programs, whose aim is to:

- Harmonize the general education and program-specific components of programs (program-based approach)
- Harmonize pre-university programs with university programs (training continuum)
- Foster the acquisition of comparable competencies throughout the college network
- Foster a type of education that contributes to the overall development of the person

This document was developed in cooperation with a program advisory committee composed of university representatives, academic deans and college teachers.

The *Science* program includes four components: a program-specific component, a general education component that is common to all programs, a general education component that is specific to each program, and a general education component that complements the program.

- The program-specific component consists of 32 credits.

- The general education component that is common to all programs consists of 16⅔ credits:
  - Language of Instruction and Literature: 7⅓ credits
  - Philosophy or Humanities: 4⅓ credits
  - Physical Education: 3 credits
  - Second Language: 2 credits

- The general education component that is specific to the program consists of 6 credits:
  - Language of Instruction and Literature: 2 credits
  - Philosophy or Humanities: 2 credits
  - Second Language: 2 credits

- The complementary general education component, which aims to expose students to subject areas outside their program of study, consists of 4 credits and includes courses in the following areas:
  - Social Sciences
  - Science and Technology
  - Modern Language
  - Mathematics Literacy and Computer Science
  - Art and Aesthetics
  - Contemporary Issues

Students may choose courses only in those areas that are outside their program of study.

Aim of the Program

The *Science, Computer Science and Mathematics* program offers students a diversified and rigorous curriculum that integrates the basic components of general and specific learning in mathematics, computer science, physics and chemistry. It enables them to pursue university studies in computer science and mathematics as well as in several fields in engineering and pure and applied sciences.

Goals of the Program

Program-Specific Component

By the end of the *Science, Computer Science and Mathematics* program, students will be able to:

- draw on subject-specific knowledge that allows for the consolidation and enrichment of their basic scientific culture
- approach complex situations from an interdisciplinary perspective
- appreciate the relationships between science, technology and society
- develop computer-based solutions to solve scientific problems using an interdisciplinary approach
- demonstrate critical judgment and intellectual rigour
- use digital technologies in a scientific context
- develop a collaborative spirit and communicate

Draw on subject-specific knowledge that allows for the consolidation and enrichment of their basic scientific culture

Students are able to draw on basic subject-specific knowledge, that is, the foundations, methods, terminology, language, symbolism and conventions specific to the disciplines in the field of study. This knowledge, at the core of a solid scientific culture, is necessary for pursuing university studies.

By the end of the program, students are able to continue their learning using an independent and planned approach that favours the gradual integration of new knowledge. They engage in structured reflection and demonstrate openness toward numerous scientific disciplines, whether emergent or established. They demonstrate strong analytical, adaptation and synthesis skills that enable them to identify and solve problems, among other things.

Lastly, students are able to reflect on what they've learned, in order to determine which university studies to pursue.

Approach complex situations from an interdisciplinary perspective

Drawing on their subject-specific knowledge, students make connections among the various disciplines. They organize their knowledge appropriately so as to use it effectively in various contexts.

By the end of the program, students adopt a broader perspective of issues by making connections between disciplines. In addition, they have developed a coherent and complementary set of skills and knowledge that enables them to create appropriate links where the interrelationships between disciplines are essential.

Appreciate the relationships between science, technology and society

Science and technology interact with each other and do not develop in a vacuum outside of society. They emerge within a historical and social context which, in turn, is influenced by scientific discoveries and inventions. Science and technology can therefore allow students to refine their view of other fields.

Students are made aware of the historical and social context in which scientific theories and technologies are developed. They understand that science can meet contemporary needs through technological innovation.

Students become aware of the importance of societal issues through knowledge that has achieved scientific consensus. They gain a deeper understanding of these issues, which is necessary for a basic scientific culture. For example, they become familiar with energy issues and the complexity of certain states of equilibrium.

Develop computer-based solutions to solve scientific problems using an interdisciplinary approach

By using computers as instruments to simulate and solve problems, students can make use of data and scientific concepts from a new perspective. Computer automation can be used to organize data and produce results in ways that were not previously possible. New tools in this field are catalysts for science, enabling us to expand the impact of scientific discoveries on the world around us.

By mastering programming concepts, students are able to find solutions to authentic problems originating in other disciplines.

In this way, students find creative computer-based solutions to a variety of scientific problems. They develop applications using a programming language to obtain or represent results, or to illustrate scientific concepts. Students put their computer knowledge into practice in the scientific field.

Demonstrate critical judgment and intellectual rigour

Students are able to construct argumentations, demonstrations and proofs. They are able to identify a certain number of ideas related to a topic and then compare, classify and evaluate them. They exercise their capacity for synthesis and arrange relevant ideas in a logical order that enables them to build coherent argumentation.

Students base their argumentation on reliable sources. They are able to analyze, sort and select the information gathered to retain the essential elements and interpret them rationally. They are careful to assess the reliability of their sources by questioning their origin and credibility and whether they are up to date. In addition, students are able to make a judgment on the scientific value of the information gathered.

Science helps students understand the world around them according to a systematic and rigorous process that includes observation, logical reasoning, experimentation and statistical analysis. For this purpose, they employ a scientific method as their tool of choice in exercising structured thinking that encourages them to demonstrate rigour and critical judgment.

Use digital technologies in a scientific context

Digital technologies play a significant role in society. Their evolution has resulted in virtual environments and numerous software applications that are useful for learning. These technologies can be used to access, process, present and share information, and much more.

Students therefore use the technology, material and software available to them, according to the terms and conditions of use. They use software applications to support their learning, including office productivity tools to present content and process information. Moreover, they are able to exploit specialized applications to analyze, develop, validate and implement a scientific software application within a recognized development framework, using a programming language as well as collaboration and source code version management tools.

At a time when computer networks and digital technologies enable access to vast quantities of information, students are able to choose and use appropriate research tools effectively. Moreover, they make use of collaboration, communication and sharing tools. Students adhere to the terms of use by making sure that content is kept secure, respecting people's privacy, and maintaining their digital integrity and that of others.

Develop a collaborative spirit and communicate

Students are able to read and write texts of a scientific nature. They are able to write a description, an argumentation, an analysis and a procedure, adhering to the presentation standards established for such documents. They write in a clear, precise and concise manner. They do so by using the language of instruction correctly as well as the appropriate form of discourse and scientific terminology. In second language learning, emphasis is placed on developing skills to understand scientific and computer documents.

Orally, students express themselves in a clear, precise and concise manner during exchanges, discussions, demonstrations and presentations. In addition to mastering basic language skills, they are able to use scientific terminology and to adapt their discourse according to the context.

Finally, students use their capacity to adapt and collaborate to build relationships with others and take on different roles within teams focused on common objectives. They are conscientious about the quality of their interactions and remain receptive to others. Students have the capacity to deal with the diversity and interdependence of individuals. They are able to reconcile divergent points of view and to help achieve consensus.

General Education Component Common to All Programs and General Education Component Specific to the Program

The general education components that are common to all programs and specific to the program contribute to the development of twelve competencies associated with the three aims of college education:

- for the aim *To educate students to live responsibly in society*:
  - Demonstrate independence and creativity in thought and action
  - Demonstrate rational, critical and ethical thinking
  - Develop strategies that promote reflection on their knowledge and actions
  - Pursue the development of a healthy and active lifestyle
  - Assume their social responsibilities

- for the aim *To help students integrate cultural knowledge into their studies*:
  - Recognize the influence of culture and lifestyle on the practice of physical activity and sports
  - Recognize the influence of the media, sciences or technology on culture and lifestyle
  - Analyse works in philosophy or the humanities emanating from different historical periods and movements
  - Appreciate literary and non-literary works of other artistic expressions emanating from different historical periods and movements

- for the aim *To help students master language as a tool for thought, communication and openness to the world*:
  - Improve communication in the second language
  - Master the basic rules of discourse and argumentation
  - Refine oral and written communication in the language of instruction

English, Language of Instruction and Literature

Students who have achieved the general education objectives in English, Language of Instruction and Literature,

- will be able to demonstrate their knowledge of the following:
  - the basic vocabulary and terminology used when discussing literary works
  - ways to apply an independent analytical approach to literary genres
  - ways to apply an independent analytical approach to literary themes
  - the appreciation of literary and non-literary works or other artistic expressions of different historical periods and movements
  - ways to identify the socio-cultural and historical context of different periods and movements
  - ways to refine oral and written communication in the language of instruction

- will be able to demonstrate their ability to do the following:
  - read, write, listen and speak at a college level of proficiency
  - develop their own ideas in arguments and theses
  - organize their arguments and theses in a discourse and edit their work
  - produce and analyze various styles of discourse
  - communicate in the styles of discourse appropriate to one or more fields of study

- will be encouraged to develop the following attitudes:
  - independence, individuality, and open-mindedness in thought and action
  - an appreciation of literature and other artistic works from different periods
  - a recognition of the role of media within a society and its culture
  - an awareness of strategies that foster self-reflective practice in their learning and actions
  - critical and ethical thought

Humanities

Humanities constitutes a thematic, multidisciplinary and, at times, transdisciplinary exploration of humankind, including its accomplishments, failures, abilities, creations, ideas and values. Students who have achieved the general education objectives in humanities

- will be able to demonstrate their knowledge of the following:
  - the main concepts, limits and uses of a form of knowledge including significant historical reference points
  - the main concepts, limits and uses of a world view
  - the nature and organization of the basic elements of an ethical question
  - methods for coherent integration of concepts and the formulation and synthesis of ideas
  - the importance and practice of adequately substantiated argumentation, written and oral

- will be able to demonstrate their ability to do the following:
  - describe, explain and organize the main elements, ideas, values and implications of a world view in a coherent fashion
  - compare world views
  - recognize the basic elements in a specific example of the organization, transmission, and use of knowledge
  - recognize forms of creativity and original thought
  - define the dimensions, limits and uses of knowledge in appropriate historical contexts
  - identify, organize and synthesize the salient elements of a particular example of knowledge
  - situate important ethical and social issues in their appropriate historical and intellectual contexts
  - explain, analyze and debate ethical issues in a personal and professional context
  - utilize the multiple strategies of critical thinking

- will be encouraged to develop the following attitudes:
  - openness to diversity and pluralism
  - awareness of the limits of knowledge claims, world views and ethical perspectives
  - respect for the points of view of others
  - empathy and acceptance of others
  - concern for global issues
  - determination to continue learning

French as a Second Language

Students who have achieved the general education objectives in French as a Second Language

- will be able to demonstrate their knowledge of the following:
  - different reading techniques
  - the formal elements needed to produce a structured text, both orally and in writing
  - different forms of discourse and their specific uses

- will be able to demonstrate their ability to do the following:
  - question, analyze, judge and defend an argument in French
  - reflect on their knowledge and actions notably by revising their written productions
  - maintain social relationships and share in the cultural life of Québec
  - establish and maintain work-related relationships in French

- will be encouraged to develop: the following attitudes of:
  - openness to the various aspects of Québec culture
  - recognition and promotion of creativity
  - readiness to participate in social and economic life

Physical Education

Students who have achieved the general education objectives in physical education

- will be able to demonstrate their knowledge of the following:
  - notions and concepts based on the findings of scientific research and how to apply them methodically to physical or sporting activities
  - the relationship between lifestyle, physical activity, physical fitness and health
  - ways to evaluate their own abilities and needs with respect to activities that can enhance their health and fitness
  - the rules, techniques and conditions involved in different types of physical or sporting activity
  - the main socio-cultural determinants of physical activity and a healthy lifestyle

- will be able to demonstrate their ability to do the following:
  - give an initial account of their abilities, attitudes and needs
  - choose physical activities on the basis of their motivation, their ability to adapt to effort and their need for change
  - apply the rules and techniques of a certain number of physical activities with a view to practising them sufficiently on a regular basis
  - set goals that are realistic, measurable, challenging and situated within a specific time frame
  - improve their mastery of basic techniques and strategies associated with physical activities
  - evaluate their skills, attitudes and progress in order to adapt their means or objectives in their practice of physical activities
  - autonomously maintain or increase their physical activity and fitness levels in order to develop a healthy and active lifestyle
  - use their creativity in physical activities
  - express their choice of activities in a clear and reasoned manner

- will be encouraged to develop the following attitudes:
  - awareness of the importance of regular and sufficient physical activity in order to improve their fitness
  - awareness of the factors that encourage them to practise physical activity more often
  - awareness of the importance of evaluating and respecting their ability to adapt to effort, as well as an awareness of the conditions necessary to carry out a physical activity program, before committing to it
  - self-confidence, self-control, cooperation, respect and understanding, through knowledge and through the practice of a physical activity
  - respect for ethical behaviour when participating in a sport or a physical activity
  - respect for individual and cultural differences as well as for the environment in which the sport or physical activity takes place
  - appreciation for the aesthetic value of physical activity as well as the opportunities for enjoyment it provides
  - readiness to adopt the values of discipline, effort, consistency and perseverance
  - readiness to promote, as a social value, the regular and sufficient practice of physical activity

Complementary General Education Component

Social Sciences

The goal of this subject area is to help students view the social sciences as a specific approach to the study of human existence. This goal may cover various aspects, including the study of the specific contribution of the social sciences to an understanding of contemporary issues and the application of approaches from the social sciences.

Science and Technology

The goal of this subject area is to present science and technology as a specific approach to the study of reality, by introducing students to this area of knowledge. This goal may cover various aspects, including the study of the general nature of science and technology and contemporary scientific or technological issues as well as the application of the scientific method.

Modern Language

The goal of this subject area is to introduce students to the basic structures and vocabulary of a third language and help them develop an awareness of the culture of its native speakers.

Mathematics Literacy and Computer Science

The goal of this subject area is to highlight a culture of mathematics and computer science. This goal may cover various aspects, including the study of the role of mathematics or computers in contemporary society as well as the use of mathematical or computer concepts, procedures and tools.

Art and Aesthetics

The goal of this subject area is to provide students with a cultural awareness by exploring various forms of art and to help students develop an aesthetic awareness. This goal may cover various aspects, including an appreciation of different art forms and the production of a work of art.

Contemporary Issues

This subject area focuses on current, transdisciplinary issues. The concept of transdisciplinarity refers to a type of approach that addresses a contemporary issue from the perspective of different disciplines and areas of knowledge, beyond a mere juxtaposition of the subjects studied.

Program Objectives and Standards

List of Objectives

Program-Specific Component
32 credits, 900 periods of instruction

Common Objectives

0C01	Analyze properties of matter and chemical changes
0P01	Analyze physical situations and phenomena using the fundamental laws and principles of classical mechanics
0P02	Analyze physical situations and phenomena using the fundamental laws and principles of electricity and magnetism
0P03	Analyze physical situations and phenomena using the fundamental laws and principles of waves and modern physics
0M01	Solve problems related to the natural sciences using statistical methods and probability concepts
0M02	Analyze problems by applying differential calculus
0M03	Analyze problems by applying integral calculus
0M04	Analyze problems using linear algebra and vector geometry concepts
0M0D	Analyze problems by applying discrete mathematics
0NFA	Develop computer programs to solve science-related problems
0NFB	Use data to solve computer problems of a scientific nature
0NFC	Develop scientific computer applications in a graphic environment
1NTC	Demonstrate the integration of learning acquired in *Science, Computer Science and Mathematics*

General Education Component Common to All Programs and General Education Component Specific to the Program
16⅔ credits and 420 periods of instruction, 6 credits and 150 periods of instruction

English, Language of Instruction and Literature

4EA0	Analyze and produce various forms of discourse
4EA1	Apply an analytical approach to literary genres
4EA2	Apply an analytical approach to a literary theme
4EAP	Communicate in the forms of discourse appropriate to one or more fields of study

Humanities

4HU0	Apply a logical analytical process to how knowledge is organized and used
4HU1	Apply a critical thought process to world views
4HUP	Apply a critical thought process to ethical issues relevant to the field of study

French as a Second Language

One objective to be met from the following:

4SF0	Apply basic concepts for communicating in standard French
4SF1	Communicate in standard French with some ease
4SF2	Communicate with ease in standard French
4SF3	Explore a cultural and literary topic

One objective to be met from the following:

4SFP	Apply basic concepts for communicating in French in relation to the student's field of study
4SFQ	Communicate in French on topics related to the student's field of study
4SFR	Communicate with ease in French on topics related to the student's field of study
4SFS	Produce a text in French on a topic related to the student's field of study

Physical Education

4EP0	Analyze one's physical activity from the standpoint of a healthy lifestyle
4EP1	Improve one's effectiveness when practising a physical activity
4EP2	Demonstrate one's ability to assume responsibility for maintaining a healthy lifestyle through the continued practice of physical activity

Complementary General Education Component
4 credits, 90 periods of instruction

Two objectives to be met from the following, in subject areas outside the student's program of study:

000V	Estimate the contribution of the social sciences to an understanding of contemporary issues
000W	Analyze one of the major problems of our time using one or more social scientific approaches
000X	Explain the general nature of science and technology and some of the major contemporary scientific or technological issues
000Y	Resolve a simple problem by applying the basic scientific method
000Z	Communicate with limited skill in a modern language
0010	Communicate on familiar topics in a modern language
0067	Communicate with relative ease in a modern language
0011	Recognize the role of mathematics or computer science in contemporary society
0012	Use various mathematical or computer science concepts, procedures and tools for common tasks
0013	Consider various forms of art produced according to aesthetic practices
0014	Produce a work of art
021L	Consider contemporary issues from a transdisciplinary perspective
021M	Explore a contemporary issue from a transdisciplinary perspective

Program-Specific Component

Common Objectives and Standards

<table>
<tr><td colspan="2" align="right">Code: 0C01</td></tr>
<tr><td>*Objective*</td><td>*Standard*</td></tr>
<tr><td>**Statement of the Competency**</td><td>**Performance Criteria for the Competency as a Whole**</td></tr>
<tr><td>Analyze properties of matter and chemical changes.</td><td>Appropriate use of terminology
Observance of mathematical and chemical formalism
Use and conversion of appropriate units of measurement
Consideration of environmental issues
Demonstration of rigour in the problem-solving approach</td></tr>
<tr><td>**Elements of the Competency**</td><td>**Performance Criteria**</td></tr>
<tr><td>1. Use chemical language and symbols.</td><td>Relevant use of basic concepts and chemical symbols [1]
Accurate application of nomenclature rules of inorganic compounds</td></tr>
<tr><td>2. Carry out the quantitative analysis of chemical systems.</td><td>Accurate application of the appropriate concepts for calculating quantities used in chemistry [2]
Accurate application of the rules of stoichiometry to different types of reactions [3]</td></tr>
<tr><td>3. Explain the properties of the elements and how they relate to the periodic classification.</td><td>Appropriate description of the main characteristics of the probabilistic model of the atom
Appropriate description of atomic orbitals and electron configurations using quantum numbers
Summary demonstration of the relationship between the electron configuration and chemical properties of elements [4]
Accurate explanation of the main periodic properties of elements [5]</td></tr>
<tr><td>4. Explain the structure of matter according to the types of chemical bonds.</td><td>Accurate distinction of compound types based on the type of bonds involved [6]
Exact calculations involving covalent bond energies
Appropriate determination of structures for polyatomic ions and molecular compounds [7]
Accurate description of atomic orbital hybridization [8]</td></tr>
<tr><td>5. Explain the main macroscopic properties of matter.</td><td>Accurate distinction of intermolecular forces
Accurate determination of the relative strength of intermolecular forces
Accurate demonstration of the relationship between the physical properties of matter and the forces involved [9]</td></tr>
</table>

6. Verify, using an experimental method, some chemical and physical properties of matter.	• Appropriate use of laboratory techniques, equipment and measurement apparatus
	• Compliance with laboratory rules for health, safety and environmental protection
	• Appropriate data processing [10]
	• Relevance of the analysis and accuracy of the results
	• Communication of results according to established requirements
	• Effective contribution to teamwork

Learning Activities

Discipline: Chemistry

Weighting: 3-2-3

Credits: 2 ⅔

Periods of instruction: 75

Indications:

Additional information on content:

[1] Chemical concepts and symbols:
- atoms, isotopes, ions and molecules
- atomic number and mass number
- charge and oxidation state
- chemical formulas (empirical and molecular)
- types of elements: metals, nonmetals, metalloids
- physical states

[2] Concepts and quantities:
- atomic mass, molar mass, number of moles
- volumetric mass density, concentrations and units of concentration

[3] Rules of stoichiometry:
- balancing of equations, including reduction-oxidation reactions
- calculation involving a limiting reactant and calculation of yield

[4] Chemical properties:
- types of ions formed (charge, valence)
- chemical inertia versus reactivity

[5] Periodic properties:
- atomic radius
- first ionization energy
- electronegativity

[6] Types of compounds:
- ionic
- molecular, including some polymers

[7] Structure:
- Linus Pauling diagram including exceptions to the octet rule and resonance (with polyatomic ions and simple organic molecules)
- three-dimensional structure using the valence shell electron pair repulsion (VSEPR) theory

[8] Hybridization:
- types: sp, sp^2 and sp^3
- atomic orbital overlap (σ et π)

[9] Physical properties:
- melting and boiling points

[10] Data processing:
- use of computer tools
- evaluation of uncertainties
- mathematical processing
- graphical representation with a trend line

	Code: 0P01

Objective	*Standard*
Statement of the Competency	**Performance Criteria for the Competency as a Whole**
Analyze physical situations and phenomena using the fundamental laws and principles of classical mechanics.	• Appropriate use of terminology • Observance of mathematical formalism • Use and conversion of appropriate units of measurement • Clear schematic diagrams of the situation to be analyzed • Accurate distinction of physical quantities associated with classical mechanics • Demonstration of rigour in the problem-solving approach • Display of critical judgment regarding the plausibility of results

Elements of the Competency	**Performance Criteria**
1. Carry out the analysis of physical situations and phenomena using translational and rotational kinematics.	• Exact calculation of the physical quantities associated with kinematics • Accurate graphical determination of the physical quantities associated with kinematics • Rigorous application of kinematic concepts and equations specific to the type of motion [1] • Correct resolution of problems related to kinematics
2. Carry out the analysis of physical situations and phenomena using the laws of dynamics for translation and rotation.	• Presentation of complete and exact free-body diagrams • Exact calculation of physical quantities associated with dynamics [2] • Rigorous application of Newton's laws for bodies in motion [3] • Rigorous application of the conditions of static equilibrium for rigid bodies at rest • Correct resolution of problems related to dynamics
3. Carry out the analysis of physical situations and phenomena using conservation principles.	• Precise calculation of work and physical quantities associated with energy [4] • Rigorous application of the principle of energy conservation to systems [5] • Exact calculation of the linear momentum and the angular momentum • Rigorous application of the conservation principles of linear momentum and angular momentum to systems • Correct resolution of problems related to the conservation principles
4. Verify, using an experimental method, some laws and principles of classical mechanics.	• Appropriate use of laboratory techniques, equipment and measurement apparatus • Appropriate data processing [6] • Relevance of the analysis and accuracy of the results • Communication of results according to established requirements • Effective contribution to teamwork

Learning Activities

Discipline:	Physics
Weighting:	3-2-3
Credits:	2 ⅔
Periods of instruction:	75
Indications:	

The compulsory content is as follows:

[1] Types of motion studied in kinematics:
- motion with constant acceleration in one and two dimensions
- parabolic motion
- uniform and uniformly accelerated circular motion
- rigid-body rotation about a fixed axis

[2] Physical quantities associated with dynamics:
- gravitational force
- contact forces
- torque
- centre of mass (position)
- moment of inertia

[3] Types of motion studied in dynamics:
- translational motion of one or more particles
- circular motion of one particle
- translational motion and rigid-body rotation about a fixed axis

[4] Physical quantities associated with energy:
- translational and rotational kinetic energies
- gravitational potential energy
- elastic potential energy
- power

[5] Systems involving conservative and non-conservative forces

[6] Data processing:
- use of computer tools
- evaluation of uncertainties
- mathematical processing
- graphical representation with a trend line

	Code: 0P02

Objective

Standard

Statement of the Competency	**Performance Criteria for the Competency as a Whole**
Analyze physical situations and phenomena using the fundamental laws and principles of electricity and magnetism.	• Appropriate use of terminology • Observance of mathematical formalism • Use and conversion of appropriate units of measurement • Clear schematic diagrams of the situation to be analyzed • Accurate distinction of the physical quantities associated with electricity and magnetism • Demonstration of rigour in the problem-solving approach • Display of critical judgment regarding the plausibility of results

Elements of the Competency	**Performance Criteria**
1. Carry out the analysis of situations and phenomena related to electrostatics.	• Exact calculation of the physical quantities associated with electrostatics [1] • Rigorous application of the concepts, laws and principles related to electrostatics • Correct resolution of problems related to electrostatics
2. Carry out the analysis of situations and phenomena related to electrokinetics.	• Rigorous application of the laws and principles suited for analyzing the movement of charged particles in an electric field • Accurate calculation of the physical quantities associated with electric circuits [2] • Rigorous application of Kirchhoff's laws to direct current circuits [3] • Correct resolution of problems related to electrokinetics
3. Carry out the analysis of situations and phenomena related to magnetism.	• Appropriate description of the characteristics of sources of magnetic fields • Accurate calculation of the magnetic force [4] • Rigorous application of the appropriate laws and principles for the motion of charged particles in a uniform magnetic field • Accurate use of the appropriate equations connecting the magnetic field and the intensity of the electric current • Correct resolution of problems related to magnetism
4. Carry out the analysis of situations and phenomena related to electromagnetic induction.	• Accurate determination of the magnetic flux for a uniform magnetic field • Rigorous application of Faraday's law to situations related to electromagnetic induction • Accurate determination of the direction of induced electric current using Lenz's law • Correct resolution of problems related to electromagnetic induction

5. Verify, using an experimental method, some laws of electricity and magnetism.	• Appropriate use of laboratory techniques, equipment and measurement apparatus
	• Appropriate data processing [5]
	• Relevance of the analysis and accuracy of the results
	• Communication of results according to established requirements
	• Effective contribution to teamwork

Learning Activities

Discipline:	Physics
Weighting:	2-2-2
Credits:	2
Periods of instruction:	60
Indications:	

The compulsory content is as follows:

[1] Physical quantities associated with electrostatics:
- electric force
- electric field produced by charged particles at rest
- electric potential produced by charged particles at rest
- potential energy of a system of charged particles

[2] Physical quantities associated with electric circuits:
- intensity of the electric current
- electric potential difference (voltage)
- electrical resistance
- capacitance of a capacitor
- electric power provided by a seat of electromotive force
- power dissipated by a resistor
- energy stored in a capacitor

[3] Electric circuits:
- circuits containing resistors (R)
- circuits containing resistors and capacitors (RC)

[4] Magnetic force:
- exerted on a charged particle
- exerted on a wire with current flowing through it

[5] Data processing:
- use of computer tools
- evaluation of uncertainties
- mathematical processing
- graphical representation with a trend line

	Code: 0P03

Objective	*Standard*
Statement of the Competency	**Performance Criteria for the Competency as a Whole**
Analyze physical situations and phenomena using the fundamental laws and principles of waves and modern physics.	• Appropriate use of terminology • Observance of mathematical formalism • Use and conversion of appropriate units of measurement • Clear schematic diagrams of the situation to be analyzed • Accurate distinction of the physical quantities associated with waves and modern physics • Demonstration of rigour in the problem-solving approach • Display of critical judgment regarding the plausibility of results

Elements of the Competency	**Performance Criteria**
1. Carry out the analysis of oscillatory motion.	• Accurate determination of the characteristics of a harmonic motion • Rigorous application of the appropriate concepts, laws and principles for analyzing a harmonic motion • Summary illustration of situations involving the resonance phenomenon • Correct resolution of problems related to oscillatory motions
2. Carry out the analysis of situations related to wave phenomena.	• Accurate distinction of types of waves [1] • Accurate determination of the characteristics of waves [2] • Rigorous application of the appropriate concepts, laws and principles for analyzing phenomena involving wave propagation • Rigorous application of the appropriate concepts, laws and principles for analyzing phenomena involving interference and diffraction of waves [3] • Correct resolution of problems related to wave phenomena
3. Carry out the analysis of phenomena related to modern physics.	• Accurate description of phenomena using appropriate physics concepts • Rigorous application of the appropriate concepts, laws and principles for analyzing quantum physics phenomena • Rigorous application of the appropriate concepts, laws and principles for analyzing nuclear physics phenomena • Correct resolution of problems involving phenomena related to modern physics
4. Address environmental issues related to radiative and energy phenomena.	• Appropriate determination of thermal energy transferred by conduction and by radiation • Appropriate determination of the impact of the greenhouse effect and radiative forcing on global warming

5. Verify, using an experimental method, some laws associated with waves and modern physics.	• Appropriate use of laboratory techniques, equipment and measurement apparatus • Appropriate data processing [4] • Relevance of the analysis and accuracy of the results • Communication of results according to expected requirements • Effective contribution to teamwork

Learning Activities

Discipline:	Physics
Weighting:	3-2-3
Credits:	2 ⅔
Periods of instruction:	75
Indications:	

The compulsory content is as follows:

[1] Types of waves:
- mechanical and electromagnetic
- travelling and standing
- transverse and longitudinal

[2] Characteristics of waves:
- amplitude
- period and frequency
- wavelength and wavenumber
- speed of propagation
- intensity
- polarization

[3] Wave interference and diffraction phenomena:
- double-slit interference
- single-slit diffraction

[4] Data processing:
- use of computer tools
- evaluation of uncertainties
- mathematical processing
- graphical representation with a trend line

	Code: 0M01
Objective	*Standard*

Statement of the Competency	**Performance Criteria for the Competency as a Whole**
Solve problems related to the natural sciences using statistical methods and probability concepts.	• Correct use of mathematical terminology and syntax • Appropriate use of necessary computer and statistical tools • Algebraic manipulation in accordance with established rules

Elements of the Competency	**Performance Criteria**
1. Use descriptive statistical methods to process data.	• Appropriate use of statistical vocabulary • Appropriate representation of a frequency distribution in the form of a table or graph • Appropriate calculation of measures of central tendency, variability and position • Accurate interpretation of tables, graphs and measurements
2. Use probability concepts in aleatory situations.	• Correct use of counting techniques [1] • Exact calculation of the probability of an event [2] • Accurate probability distribution of discrete and continuous variables • Correct resolution of problems involving the laws of probability [3]
3. Use statistical inference methods to characterize a population.	• Accurate recognition of conditions for applying the Central Limit Theorem • Accurate interpretation of the margin of error • Appropriate estimation by confidence interval [4] • Correct use of hypothesis testing [5] • Correct resolution of problems calling for the use of statistical inference methods
4. Determine the nature and intensity of the relationship between two variables.	• Accurate determination of the equation of the regression line • Accurate interpretation of the coefficients [6] • Correct resolution of problems involving the concept of a regression line • Accurate determination of the dependency relationship between two qualitative variables • Correct resolution of problems involving the chi-square test of independence

Learning Activities
Discipline: Mathematics
Weighting: 2-1-2
Credits: 1 ⅔
Periods of instruction: 45
Indications:

Additional information on content:

[1] Counting techniques: permutations, arrangements and combinations

[2] Probability of an event: probabilities of dependent events, probabilities of independent events, conditional probabilities

[3] Laws of probability: binomial distribution and normal distribution

[4] Estimation of a confidence interval using the:
- mean of a large sample ($n \geq 30$)
- mean of a small sample ($n < 30$)
- proportion of a large sample ($n \geq 30$)

[5] Hypothesis test using the:
- mean of a large sample ($n \geq 30$)
- mean of a small sample ($n < 30$)
- proportion of a large sample ($n \geq 30$)

[6] Coefficients: linear correlation coefficient and coefficient of determination

	Code: 0M02

Objective	*Standard*
Statement of the Competency	**Performance Criteria for the Competency as a Whole**
Analyze problems by applying differential calculus.	• Proper use of language and concepts in the application of differential calculus [1] • Correct use of mathematical terminology and syntax • Algebraic manipulation in accordance with established rules • Appropriate use of necessary computer tools • Demonstration of rigorous mathematical reasoning through the use of concepts, properties and theorems

Elements of the Competency	**Performance Criteria**
1. Determine the limit of a function.	• Accurate algebraic and graphic determination of the limit of a function • Accurate determination of infinite limits and limits at infinity • Correct use of algebraic manipulation for evaluating an indeterminate form [2] • Accurate determination of the continuity of a function at a point and on an interval
2. Determine the derivative function.	• Correct distinction between average rate of change and instantaneous rate of change • Correct use of the definition of the derivative • Exact calculation of the derivative function • Accurate interpretation of the derivative function • Relevant application of derivative rules and formulas [3]
3. Use the methods of differential calculus in mathematical applications.	• Accurate determination of the equation of the tangent line to a function at a point • Accurate use of L'Hospital's rule for evaluating indeterminate forms [2] • Relevant application of the methods of differential calculus to analyze a function [4]
4. Carry out the analysis of problems related to the natural sciences.	• Application of appropriate methods of differential calculus • Correct resolution of problems involving rates of change • Correct resolution of problems involving related rates of change • Correct resolution of optimization problems • Accurate interpretation of results

Learning Activities

Discipline:	Mathematics
Weighting:	3-2-3
Credits:	2 ⅔
Periods of instruction:	75
Indications:	

Additional information on content:

[1] Previously acquired concepts:
- Algebraic expressions: factoring, simplification and operations on algebraic fractions, rationalizing denominators, division by a polynomial, common denominators
- Solving equations and inequalities
- Graphical representations of basic functions: algebraic, piecewise, exponential, logarithmic, trigonometric
- Main characteristics of a function: zeroes, *y*-intercept and signs of the function
- Laws of exponents and properties of logarithms
- Use of the standard unit circle and of relevant trigonometric identities

Concepts to be acquired:
- Domain of a function containing: rational expressions, n^{th} roots of a polynomial and logarithms
- Graphical representations of basic functions: inverse trigonometric functions (arcsine, arctangent)

[2] Indeterminate forms: $\frac{0}{0}, \frac{\pm\infty}{\pm\infty}$

[3] Rules of derivatives: usual rules (addition, subtraction, multiplication by a scalar, product, quotient), higher order derivatives, chain rule, implicit differentiation

[4] Analysis of a function:
- domain, *y*-intercept and zeroes
- vertical and horizontal asymptotes
- intervals of increase and decrease, relative and absolute extrema
- intervals of concavity and inflection points
- sketch of the function graph

	Code: 0M03

Objective	*Standard*
Statement of the Competency	**Performance Criteria for the Competency as a Whole**
Analyze problems by applying integral calculus.	• Correct use of mathematical terminology and syntax • Algebraic manipulation in accordance with established rules • Appropriate use of necessary computer tools • Demonstration of rigorous mathematical reasoning through the use of concepts, properties and theorems

Elements of the Competency	**Performance Criteria**
1. Evaluate limits presenting indeterminate forms.	• Correct recognition of indeterminate forms [1] • Accurate manipulation of indeterminate forms • Accurate determination of a limit using L'Hospital's rule
2. Determine the indefinite integral of a function.	• Correct use of the basic derivative rules and formulas in order to determine an antiderivative • Correct use of the substitution rule (change of variables) • Relevant application of the rules, formulas and some common integration techniques [2]
3. Determine the definite integral of a function over an interval.	• Correct use of the definition and properties of the definite integral • Correct use of the Fundamental Theorem of Calculus
4. Expand functions into power series.	• Accurate determination of the general term of a series • Appropriate determination of the convergence or divergence of real series • Accurate determination of the interval of convergence of a power series • Accurate determination of the Maclaurin series expansion of a function
5. Use the methods of integral calculus in mathematical applications.	• Appropriate graphical representation of a bounded region • Accurate determination of the area of a bounded region • Accurate determination of the volume of a solid of revolution [3] • Accurate determination of an improper integral • Accurate determination of the integral of a function using a Maclaurin series expansion
6. Carry out the analysis of problems related to science.	• Rigorous use of the methods of integral calculus • Correct resolution of problems using series and definite and indefinite integrals • Correct resolution of problems using separable differential equations • Accurate interpretation of results

Learning Activities	
Discipline:	Mathematics
Weighting:	2-2-2
Credits:	2
Periods of instruction:	60
Indications:	

Additional information on content:

[1] Indeterminate forms: $\infty - \infty,\ 0 \cdot \infty,\ (0^+)^0,\ 1^{\pm\infty},\ \infty^0$

[2] Common integration techniques: integration by parts, trigonometric substitutions

[3] Methods: disks and cylinders

	Code: 0M04

Objective	*Standard*
Statement of the Competency	**Performance Criteria for the Competency as a Whole**
Analyze problems using linear algebra and vector geometry concepts.	• Correct use of mathematical terminology and syntax • Algebraic manipulation in accordance with established rules • Appropriate use of necessary computer tools • Demonstration of rigorous mathematical reasoning through the use of concepts, properties and theorems

Elements of the Competency	**Performance Criteria**
1. Use the language of matrices.	• Correct recognition of specific matrices [1] • Correct operation on matrices [2] • Appropriate use of the properties of determinants • Exact calculation of the determinant of a matrix
2. Manipulate two- and three-dimensional geometric and algebraic vectors.	• Correct identification of the characteristics of vectors [3] • Use of appropriate vector operations [4] • Appropriate graphical representations of vectors in the Cartesian plane and in Euclidean space • Accurate interpretation of linear independence and dependence of vectors • Accurate use of a basis • Accurate determination of the orthogonal projection • Accurate determination of vector products [5]
3. Represent lines and planes in the Euclidean space.	• Accurate determination of equations for lines and for planes [6] [7] • Appropriate graphical representation of lines and planes • Accurate determination of the relative position between lines and planes
4. Use the methods of linear algebra and vector geometry in mathematical applications.	• Accurate determination of the inverse of a matrix • Correct use of matrix methods to solve systems of linear equations [8] • Accurate interpretation of the types of solutions of systems of linear equations • Exact calculation of distances and angle measurements • Accurate determination of the intersection between lines and planes • Rigorous proofs of propositions
5. Apply linear algebra and vector geometry concepts to solve problems related to science.	• Rigorous use of linear algebra and vector geometry methods • Correct resolution of problems using matrices • Correct resolution of problems using vectors • Relevant application of vector products • Accurate interpretation of results

Learning Activities

Discipline:	Mathematics
Weighting:	2-2-2
Credits:	2
Periods of instruction:	60
Indications:	

Additional information on content:

[1] Specific matrices: identity, zero, symmetric, antisymmetric, diagonal, triangular, reduced row echelon form and transpose

[2] Matrix operations: addition, scalar multiplication, multiplication of matrices and calculation of the inverse matrix

[3] Characteristics of vectors: magnitude, sense, direction and angles

[4] Vector operations: addition, subtraction, scalar multiplication and linear combination

[5] Vector products: dot product, cross product and triple scalar product

[6] Line equations: vector, parametric and symmetric

[7] Equations of a plane: vector, parametric and Cartesian

[8] Methods of solving: Gauss, Gauss-Jordan and inverse matrix

	Code: 0M0D
Objective	***Standard***
Statement of the Competency	**Performance Criteria for the Competency as a Whole**
Analyze problems by applying discrete mathematics.	• Accurate use of mathematics terminology, syntax and formalism • Demonstration of rigorous mathematical reasoning through the use of concepts, properties and theorems

Elements of the Competency	**Performance Criteria**
1. Write a mathematical proof.	• Accurate manipulation of concepts in accordance with the rules of mathematical logic [1] • Selection of appropriate proof techniques [2] • Accurate application of proof techniques
2. Use the language of set theory and functions.	• Accurate description of sets • Accurate distinction of the concepts of membership, inclusion and equality • Accurate execution of operations on sets • Accurate recognition of the characteristics of functions • Accurate recognition of injective, surjective and bijective functions
3. Carry out the analysis of problems using counting techniques.	• Accurate detection of the presence of order and repetition • Selection of appropriate counting techniques • Accurate application of counting techniques to solve problems
4. Solve problems using recursion.	• Accurate modelling of problems using recursion • Accurate solving of linear recurrences
5. Apply number theory to computing contexts.	• Accurate conversion of numbers represented in positional notation from one base to another • Accurate execution of arithmetic operations on numbers represented in positional notation • Accurate use of Euclid's algorithm and modular arithmetic • Accurate use of concepts and fundamental results of number theory in a computing context [3]
6. Analyze problems using graph theory.	• Accurate distinction of types of graphs and their uses [4] • Accurate representations of a graph [5] • Accurate use of matrix language when studying a graph • Accurate modelling of a situation using a graph • Accurate identification of graph isomorphism

Learning Activities

Discipline:	Mathematics
Weighting:	3-2-3
Credits:	2 ⅔
Periods of instruction:	75
Indications:	

Additional information on content:

[1] Concepts: operators, truth tables, implications, equivalencies, quantifiers

[2] Proof techniques: direct, indirect (by contrapositive), reductio ad absurdum (by contradiction), recursive, pigeon-hole principle

Examples of content:

[3] Contexts such as private-key (symmetric) cryptography and public-key (asymmetric) cryptography, RSA, cryptanalysis, primality testing, hash functions, parallel arithmetic, checksums, pseudorandom number generation

[4] Types of graphs such as simple graphs, directed graphs, weighted graphs, multigraphs, tree diagrams

[5] Schema, adjacency list, adjacency matrix, set of vertices, set of edges

	Code: 0NFA
Objective	***Standard***
Statement of the Competency	**Performance Criteria for the Competency as a Whole**
Develop computer programs to solve science-related problems.	• Appropriate use of terminology • Correct use of required software development tools • Demonstration of rigour and perseverance

Elements of the Competency	**Performance Criteria**
1. Plan a computerized solution to a scientific problem.	• Appropriate recognition of the concepts involved in a problem [1] • Correct decomposition of the problem • Accurate determination of inputs and outputs • Accurate recognition of basic data types and data structures [2] • Accurate determination of the necessary processing • Preparation of appropriate test cases to validate the program
2. Develop an algorithm to solve the problem.	• Coherent structuring of the algorithm, up to and including the instructions • Efficient organization of instructions [3] • Appropriate use of basic data types and arrays • Accurate use of arithmetical, relational and logical expressions • Correct tracing of algorithm execution • Design of a correct algorithm for efficiency
3. Use a programming language.	• Accurate translation of the algorithm into the required programming language • Observance of programming language syntax • Rigorous application of programming standards and best practices • Appropriate use of standards libraries • Pertinent documentation of the code • Appropriate use of data types and their behaviours, if applicable
4. Verify the proper functioning of the program.	• Detection of operational errors • Accurate understanding of messages [4] • Correct use of a debugger • Relevance of corrections made

Learning Activities

Discipline:	Computer science
Weighting:	2-3-3
Credits:	2 ⅔
Periods of instruction:	75
Indications:	

Additional information on content:

[1] Scientific problems must refer to previously acquired concepts.

[3] Instructions containing:
- control structures
- subroutines

[4] Students must recognize the messages, regardless of the language they are in.

Examples of content:

[2] Data structures: lists, classes, structures, etc.

	Code: 0NFB
Objective	*Standard*

Statement of the Competency	Performance Criteria for the Competency as a Whole
Use data to solve computer problems of a scientific nature.	• Appropriate use of terminology • Correct use of software development tools • Adherence to best practices in programming • Demonstration of autonomy, rigour and perseverance • Accurate use of documentary resources

Elements of the Competency	Performance Criteria

1. Apply an object-oriented development approach.	• Appropriate modelling of classes
	• Appropriate representation of the class model
	• Rigorous application of object-oriented programming principles and techniques:
	   o encapsulation
	   o inheritance
	   o polymorphism
	• Accurate organization of program architecture according to the division of responsibility

2. Proceed with the logical organization of data.	• Correct analysis of a situation in terms of the data available, desired results and necessary processing • Sound comparison of the possibilities offered by different data structures [1] • Accurate determination of the data structures required • Correct manipulation or programming of the data structures
3. Apply data manipulation algorithms.	• Accurate application of manipulation techniques for data in memory [2] • Appropriate consideration of the effectiveness of the algorithm in time and in space • Correct use of techniques for reading and writing external structured data [3]

Learning Activities	
Discipline:	Computer science
Weighting:	2-3-3
Credits:	2 ⅔
Periods of instruction:	75
Indications:	

Examples of content:

[1]   Data structures: arrays, lists, queues, stacks, trees, dictionaries, sets, graphs, etc.

[2]   Data manipulation techniques: updating, sorting, searching, hashing, etc.

[3]   External structured data formats: JSON, CSV, XML, TXT, etc.

	Code: 0NFC

Objective / *Standard*

Statement of the Competency	Performance Criteria for the Competency as a Whole
Develop scientific computer applications in a graphic environment.	• Appropriate use of terminology • Correct use of required software development tools • Rigorous application of programming standards and best practices • Appropriate management of exceptions • Correct use of documentary resources • Production and updating of complete and accurate documentation • Demonstration of autonomy, rigour and perseverance

Elements of the Competency	Performance Criteria
1. Build the graphical user interface.	• Accurate planning of user interface organization [1] • Appropriate use of graphic libraries to enable the illustration of the situation • Appropriate use of controls for user interaction [2] • Appropriate programming or generation of the graphical user interface
2. Carry out the steps necessary for programming an application of scientific nature.	• Appropriate preparation for development of an application of scientific nature • Appropriate use of the version control system • Appropriate decomposition of the code according to dis-tinct responsibilities • Appropriate programming and execution of unit testing • Appropriate programming of the application • Correct deployment or installation of the application • Rigorous validation of the proper function of the application
3. Use advanced programming language concepts.	• Judicious use of language possibilities [3] • Judicious use of various data structures • Judicious use of event-driven, concurrent or asynchronous programming concepts

Learning Activities
Discipline: Computer science
Weighting: 2-3-3
Credits: 2 ⅔
Periods of instruction: 75
Indications:
Applications may require the use of scientific data in various formats such as open data.
Examples of content:
[1] Graphical user interface organization: literature review, prototyping, etc.
[2] Controls and events for user interaction: button, list, menu, keyboard, mouse, mobile device, etc.
[3] Language-related possibilities: libraries, recursion, lambda expressions, delegates, generic programming, elements of functional programming, etc.

	Code: 1NTC

Objective	*Standard*
Statement of the Competency	**Performance Criteria for the Competency as a Whole**
Demonstrate the integration of learning acquired in *Science, Computer Science and Mathematics*.	• Demonstration of sustained teamwork • Rigorous application of programming standards and best practices • Demonstration of the professional attitudes required for scientific and technical work • Demonstration of autonomy, rigour and perseverance • Respect for the rules of digital ethics relating to intellectual property, security and confidentiality • Correct use of documentary resources in English and in French

Elements of the Competency	**Performance Criteria**
1. Design a scientific computer project based on the learning acquired.	• Judicious reinvestment of learning • Correct use of software development and collaboration tools • Appropriate development of the application • Appropriate validation of the project's operation • Adherence to the methodology established • Appropriate documentation of elements relevant to the project's development
2. Carry out the computer project of scientific nature.	• Judicious reinvestment of learning • Correct use of software development and collaboration tools • Appropriate development of the application • Appropriate validation of the project's operation • Adherence to the methodology established • Appropriate documentation of elements relevant to the project's development
3. Present the project.	• Relevant demonstration of the application • Clear oral and written communication of the steps involved in carrying out the integration project • Explicit reference to the learning that was considered important for solving problems encountered in carrying out the project • Observance of the rules of English and presentation standards
4. Evaluate one's own integration process.	• Meaningful summary of one's learning • Critical evaluation of one's contribution to the project • Accurate recognition of the impact of the program on one's future path

Learning Activities	
Disciplines:	Computer science
Weighting:	1-4-4
Credits:	3
Periods of instruction:	75

General Education Component Common to All Programs and General Education Component Specific to the Program

English, Language of Instruction and Literature	Code: 4EA0
Objective	*Standard*

Statement of the Competency
Analyze and produce various forms of discourse.

Elements of the Competency	Performance Criteria
1. Identify the characteristics and functions of the components of literary texts.	• Accurate explanation of the denotation of words • Adequate recognition of the appropriate connotation of words • Accurate definition of the characteristics and function of each component
2. Determine the organization of facts and arguments of a given literary text.	• Clear and accurate recognition of the main idea and structure • Clear presentation of the strategies employed to develop an argument or thesis
3. Prepare ideas and strategies for a projected discourse.	• Appropriate identification of topics and ideas • Adequate gathering of pertinent information • Clear formulation of a thesis • Coherent ordering of supporting material
4. Formulate a discourse.	• Appropriate choice of tone and diction • Correct development of sentences • Clear and coherent development of paragraphs • Formulation of a 750-word discourse
5. Revise the work.	• Appropriate use of revision strategies • Appropriate revision of form and content

Learning Activities	
Discipline:	English, Language of Instruction and Literature
Weighting:	2-2-4 or 1-3-4
Credits:	2 ⅔

English, Language of Instruction and Literature	Code: 4EA1

Objective	*Standard*

Statement of the Competency

Apply an analytical approach to literary genres.

Elements of the Competency	Performance Criteria
1. Distinguish genres of literary texts.	• Clear recognition of the formal characteristics of a literary genre
2. Recognize the use of literary conventions within a specific genre.	• Accurate recognition of the figurative communication of meaning • Adequate explanation of the effects of significant literary and rhetorical devices
3. Situate a work within its historical and literary period.	• Appropriate recognition of the relationship of a text to its period
4. Write a critical analysis of a literary genre.	• Selective use of appropriate terminology • Effective presentation of a 1000-word coherent response to a literary text
5. Revise the work.	• Appropriate use of revision strategies • Appropriate revision of form and content

Learning Activities

Discipline:	English, Language of Instruction and Literature
Weighting:	2-2-3
Credits:	2⅓

English, Language of Instruction and Literature	Code: 4EA2

Objective	*Standard*

Statement of the Competency
Apply an analytical approach to a literary theme.

Elements of the Competency	**Performance Criteria**
1. Recognize the treatment of a theme within a literary text.	• Clear recognition of elements within the text, which define and reinforce a theme and its development • Adequate demonstration of the effects of significant literary and rhetorical devices
2. Situate a literary text within its cultural context.	• Appropriate recognition of a text as an expression of cultural context • Adequate demonstration of the effects of significant literary and rhetorical devices
3. Detect the value system inherent in a literary text.	• Appropriate identification of expression (explicit / implicit) of a value system in a text
4. Write an analysis on a literary theme.	• Selective use of appropriate terminology • Effective presentation of a 1000-word coherent response to a literary text
5. Revise the work.	• Appropriate use of revision strategies • Appropriate revision of form and content

Learning Activities	
Discipline:	English, Language of Instruction and Literature
Weighting:	2-2-3
Credits:	2 ⅓

English, Language of Instruction and Literature	Code: 4EAP

Objective	*Standard*

Statement of the Competency

Communicate in the forms of discourse appropriate to one or more fields of study.

Elements of the Competency	Performance Criteria
1. Identify the forms of discourse appropriate to given fields of study.	• Accurate recognition of specialized vocabulary and conventions • Accurate recognition of the characteristics of the form of discourse • Exploration of a variety of topics
2. Recognize the forms of discourse appropriate to given fields of study.	• Clear and accurate recognition of the main ideas and structure • Appropriate distinction between fact and argument
3. Formulate an oral and a written discourse.	• Examine ways to address and structure a given topic • Appropriate choice of tone and diction • Correctly developed sentences • Clearly and coherently developed paragraphs • Appropriate use of program-related communication strategies including media and technology • Formulation of a 1000-word discourse
4. Revise the work.	• Appropriate use of revision strategies • Appropriate revision of form and content

Learning Activities

Discipline:	English, Language of Instruction and Literature
Periods of instruction:	60
Credits:	2

Humanities	Code: 4HU0
Objective	***Standard***

Statement of the Competency
Apply a logical analytical process to how knowledge is organized and used.

Elements of the Competency	Performance Criteria
1. Recognize the basic elements of a field of knowledge.	• Appropriate description of the basic elements • Appropriate use of terminology relevant to a field of knowledge
2. Define the modes of organization and utilization of a field of knowledge.	• Adequate definition of the dimensions, limits, and uses of a field of knowledge
3. Situate a field of knowledge within its historical context.	• Accurate identification of the main components in the historical development of a field of knowledge • Accurate description of the effects of historical development and social context on the limits and uses of a field of knowledge
4. Organize the main components into coherent patterns.	• Coherent organization of the main components
5. Produce a synthesis of the main components.	• Appropriate analysis of the components • Coherent synthesis of the main components • Appropriate expression, including a significant individual written component, of an analysis of the context, importance and implications of the organization and uses of knowledge. • Appropriate use of revision strategies • Appropriate revision of form and content

Learning Activities	
Discipline:	Humanities
Weighting:	3-1-3
Credits:	2 ⅓

Humanities	Code: 4HU1

Objective	*Standard*

Statement of the Competency
Apply a critical thought process to world views.

Elements of the Competency	**Performance Criteria**
1. Describe world views.	• Accurate description of a society or group with a distinctive world view • Appropriate use of terminology relevant to these societies or groups
2. Explain the major ideas, values, and implications associated with a given world view.	• Adequate explanation of the salient components of a world view
3. Organize the ideas, values and experiences of a world view into coherent patterns.	• Coherent organization of ideas about a world view • Appropriate expression, including a significant individual written component, of an analysis of the context, importance, and implications of world views
4. Compare world views.	• Comparative analysis of these world views • Appropriate inclusion of central elements, relationships, and organizational principles of the societies or groups in the analysis
5. Convey the ideas, attitudes, and experiences of the societies or groups studied.	• Coherent integration of the importance and implications of the world views for the given societies or groups • Appropriate use of revision strategies • Appropriate revision of form and content

Learning Activities	
Discipline:	Humanities
Weighting:	3-0-3
Credits:	2

Humanities	Code: 4HUP

Objective   *Standard*

Statement of the Competency
Apply a critical thought process to ethical issues relevant to the field of study.

Elements of the Competency	Performance Criteria
1. Situate significant ethical issues in appropriate world views and fields of knowledge.	• Accurate recognition of the basic elements of ethical issues • Appropriate use of relevant terminology • Adequate identification of the main linkages with world views and fields of knowledge
2. Explain the major ideas, values, and social implication of ethical issues.	• Adequate description of the salient components of the issues
3. Organize the ethical questions and their implications into coherent patterns.	• Coherent organization of the ethical questions and their implications • Appropriate expression, including a significant individual written component, of an analysis of the context, importance and implications of the issues
4. Debate the ethical issues.	• Adequate development of substantiated argumentation including context and diverse points of view • Clear articulation of an individual point of view • Appropriate use of revision strategies • Appropriate revision of form and content

Learning Activities	
Discipline:	Humanities
Periods of instruction:	45
Credits:	2

French as a Second Language (Level I)	Code: 4SF0

Objective *Standard*

Statement of the Competency

Apply basic concepts for communicating in standard French.

Elements of the Competency	Performance Criteria
1. Write and revise a simple text.	• Clear, coherent formulation of a text of about 250 words • Adequate development of the text: intention, topic, reader • Formulation of simple, well-constructed sentences • Use of adequate vocabulary for the task • Satisfactory application of the rules of grammar, in particular agreement in gender and number; regular verbs; verb tenses in the present, compound past and simple future • Satisfactory correction of errors in spelling or grammar • Appropriate use of revision strategies
2. Understand the meaning of a simple text.	• Accurate description of the general meaning and essential ideas of a 500-word text • Accurate identification of the difficulties in understanding the text • Appropriate use of reading techniques • Accurate identification of the main elements of the text
3. Convey a simple oral message.	• Clear and coherent formulation of an oral presentation of at least four minutes • Appropriate use of standard vocabulary • Clear and coherent statements
4. Understand the meaning of a simple oral message.	• Accurate identification of the general meaning and essential ideas of an oral message of at least four minutes • Accurate identification of the difficulties in understanding the message • Accurate description of the general meaning and essential ideas of the message

Learning Activities

Discipline:	French as a Second Language
Weighting:	2-1-3
Credits:	2

French as a Second Language (Level II)	Code: 4SF1
Objective	*Standard*

Statement of the Competency
Communicate in standard French with some ease.

Elements of the Competency	Performance Criteria
1. Write and revise a simple text.	• Writing of a text of about 350 words • Respect for grammar and spelling rules • Appropriate use of the main elements of the corpus • Clear, coherent formulation of sentences • Coherent organization of paragraphs • Appropriate use of revision strategies • Satisfactory correction of spelling and grammatical errors
2. Interpret a written text.	• Accurate identification of the main ideas and structure of a text of 700 to 1 000 words • Accurate identification of the main elements of the text • Accurate explanation of the meaning of the words of the text
3. Produce a planned oral text.	• Clear and coherent formulation of an oral presentation of at least five minutes • Appropriate use of standard vocabulary • Respect for the level of language and rules of grammar and pronunciation
4. Interpret a simple oral text.	• Accurate identification of the main elements of an oral text of at least five minutes • Accurate identification of the ideas and subjects dealt with in the text • Accurate explanation of the meaning of the words of the text

Learning Activities	
Discipline:	French as a Second Language
Weighting:	2-1-3
Credits:	2

French as a Second Language (Level III)	Code: 4SF2

Objective *Standard*

Statement of the Competency

Communicate with ease in standard French.

Elements of the Competency	Performance Criteria
1. Write a text of moderate complexity.	• Writing of a text of about 450 words • Respect for grammar and spelling rules • Adaptation to the intended audience • Appropriate use of the main elements of the corpus • Clear and coherent formulation of sentences, including at least three that are complex • Coherent organization of paragraphs
2. Revise and correct a text of moderate complexity.	• Appropriate use of revision strategies • Appropriate revision of the text
3. Comment on a written text of moderate complexity.	• Accurate identification of the main elements of a text of between 2 500 and 3 000 words • Accurate explanation of the meaning of the words of the text • Accurate identification of the main and secondary ideas, of facts and opinions • Accurate identification of what is implicit and what is explicit
4. Produce a planned oral text of moderate complexity.	• Clear and coherent formulation of an oral presentation of at least five minutes • Appropriate use of standard vocabulary • Respect for the level of language and rules of grammar and pronunciation • Adaptation to the intended audience • Appropriate sequencing of ideas

Learning Activities

Discipline:	French as a Second Language
Weighting:	2-1-3
Credits:	2

French as a Second Language (Level IV)	Code: 4SF3

Objective	*Standard*

Statement of the Competency

Explore a cultural and literary topic.

Elements of the Competency	Performance Criteria
1. Write a text on a cultural or literary topic.	• Clear and coherent formulation of a text of about 550 words • Respect for the topic • Respect for grammar and spelling rules • Adaptation to the intended audience • Appropriate use of the main elements of the corpus • Clear articulation of a personal point of view
2. Revise and correct a text on a cultural or literary topic.	• Appropriate use of revision strategies • Appropriate revision of the text
3. Analyze a cultural or literary text.	• Personal formulation of the main elements of the text • Identification of the main themes • Identification of clues that help situate the text in its sociocultural and historical context • Accurate identification of the values expressed • Accurate identification of the structure of the text • Clear articulation of a personal point of view

Learning Activities

Discipline:	French as a Second Language
Weighting:	3-0-3
Credits:	2

French as a Second Language (Level I)	Code: 4SFP
Objective	*Standard*

Statement of the Competency
Apply basic concepts for communicating in French in relation to the student's field of study.

Elements of the Competency	**Performance Criteria**
1. Write and revise a short text related to the student's field of study.	• Accurate identification of difficulties in writing • Appropriate use of writing techniques • Appropriate use of standard and specialized vocabulary • Clear and coherent formulation of the text • Appropriate use of revision strategies • Satisfactory correction of spelling and grammatical errors
2. Understand the meaning and characteristics of a text related to the student's field of study.	• Accurate identification of difficulties in understanding the text • Accurate identification of the characteristics of the text • Accurate identification of specialized vocabulary • Accurate identification of the main elements of the text • Accurate description of the general meaning and essential ideas of the text
3. Convey a simple oral message related to the student's field of study.	• Accurate identification of the difficulties in oral expression • Appropriate use of techniques of oral expression • Appropriate use of standard and specialized vocabulary • Intelligible expression of the message
4. Understand the meaning of a simple oral message related to the student's field of study.	• Accurate identification of difficulties in understanding the message • Accurate identification of the characteristics of the message • Accurate identification of specialized vocabulary • Accurate identification of the main elements of the message • Accurate description of the general meaning and essential ideas of the message

Learning Activities	
Discipline:	French as a Second Language
Periods of instruction:	45
Credits:	2

French as a Second Language (Level II)	Code: 4SFQ

Objective   *Standard*

Statement of the Competency

Communicate in French on topics related to the student's field of study.

Elements of the Competency	Performance Criteria
1. Write a text related to the student's field of study.	• Appropriate use of specialized vocabulary and of conventions specific to different types of texts • Respect for the level of language and rules of grammar and spelling • Clear and coherent formulation of the text • Appropriate use of writing techniques
2. Revise and correct a text on a topic related to the student's field of study.	• Appropriate use of revision strategies • Satisfactory correction of spelling and grammatical errors
3. Differentiate the types of texts specific to the student's field of study.	• Accurate identification of the formal characteristics of each of the main types of texts and the conventions used
4. Analyze texts representative of the student's field of study.	• Accurate identification of the main elements of the text • Accurate interpretation of specialized vocabulary • Accurate identification of the ideas and subjects dealt with • Appropriate use of reading and listening techniques

Learning Activities

Discipline:	French as a Second Language
Periods of instruction:	45
Credits:	2

French as a Second Language (Level III)	Code: 4SFR
Objective	*Standard*

Statement of the Competency

Communicate with ease in French on topics related to the student's field of study.

Elements of the Competency	Performance Criteria
1. Produce a text on a topic related to the student's field of study.	• Respect for the topic • Appropriate use of specialized vocabulary and the conventions specific to different types of texts • Respect for the level of language and rules of grammar and spelling • Clear and coherent formulation of the text • Appropriate sequencing of ideas • Appropriate form for the content
2. Revise and correct a text on a topic related to the student's field of study.	• Appropriate use of revision strategies • Satisfactory correction of spelling and grammatical errors
3. Comment on texts specific to the student's field of study.	• Accurate identification of the formal characteristics of the main types of texts and the conventions used • Accurate explanation of the meaning of the words in the text • Accurate identification of the structure of the text • Accurate reformulation of the main and secondary ideas, of the facts and opinions • Accurate use of specialized vocabulary

Learning Activities

Discipline:	French as a Second Language
Periods of instruction:	45
Credits:	2

French as a Second Language (Level IV)	Code: 4SFS

Objective *Standard*

Statement of the Competency
Produce a text in French on a topic related to the student's field of study.

Elements of the Competency	**Performance Criteria**
1. Write a text on a topic related to the student's field of study.	• Respect for the topic
	• Appropriate use of specialized vocabulary and the conventions specific to different types of texts
	• Appropriate choice of the main elements of the corpus based on the type of text
	• Clear and coherent formulation of the text
	• Respect for the level of language and rules of grammar and spelling
	• Clear articulation of a personal point of view
2. Revise and correct a text on a topic related to the student's field of study.	• Appropriate use of revision strategies
	• Satisfactory correction of spelling and grammatical errors
3. Analyze a text related to the student's field of study.	• Precise differentiation of the formal characteristics of specific types of texts
	• Personal formulation of the main elements
	• Listing of the main themes
	• Accurate identification of the structure of the text
	• Identification of clues that help situate the text in its context
	• Clear articulation of a personal point of view
	• Accurate association of elements of the text with the topic

Learning Activities	
Discipline:	French as a Second Language
Periods of instruction:	45
Credits:	2

Physical Education	Code: 4EP0
Objective	*Standard*

Statement of the Competency

Analyze one's physical activity from the standpoint of a healthy lifestyle.

Elements of the Competency	Performance Criteria
1. Establish the relationship between one's lifestyle habits and health.	• Proper use of documentation from scientific research or the media • Recognition of the influence of social and cultural factors on the practice of physical activity • Pertinent links made between one's lifestyle habits and the impact they have on health
2. Be physically active in a manner that promotes one's health.	• Respect for the rules specific to the physical activity practised • Respect for codes of ethics, safety rules and regulations when being physically active • Respect for one's abilities when practising physical activities
3. Recognize one's needs, abilities and motivational factors with respect to regular and sufficient physical activity.	• Appropriate use of strategies for the quantitative and qualitative evaluation of one's physical condition • Overall assessment of one's needs and abilities in terms of physical activity • Overall assessment of one's motivational factors with respect to being sufficiently active on a regular basis
4. Propose physical activities that promote one's health.	• Appropriate choice of physical activities according to one's needs, abilities and motivational factors • Use of clear reasoning to explain the choice of physical activity

Learning Activities

Discipline:	Physical Education
Weighting:	1-1-1
Credits:	1

Physical Education	Code: 4EP1
Objective	*Standard*

Statement of the Competency
Improve one's effectiveness when practising a physical activity.

Elements of the Competency	**Performance Criteria**
1. Plan an approach to improve one's effectiveness when practising a physical activity.	• Initial assessment of one's abilities and attitudes when practising a physical activity • Statement of one's expectations and needs with respect to the ability to practise the activity • Appropriate formulation of personal objectives • Appropriate choice of the means to achieve one's objectives • Use of clear reasoning to explain the choice of physical activity
2. Use a planned approach to improve one's effectiveness when practising a physical activity.	• Respect for the rules and regulations of the physical activity • Respect for codes of ethics, safety rules and regulations when being physically active • Appropriate use of strategies for the quantitative and qualitative evaluation of one's motor skills • Periodic assessment of one's abilities and attitudes when practising a physical activity • Meaningful interpretation of progress made and the difficulties encountered in the practice of physical activity • Pertinent, periodic and proper adjustments of one's objectives or means • Appreciable improvement in one's motor skills, techniques or complex strategies required by the physical activity

Learning Activities	
Discipline:	Physical Education
Weighting:	0-2-1
Credits:	1

Physical Education	Code: 4EP2

Objective   *Standard*

Statement of the Competency

Demonstrate one's ability to assume responsibility for maintaining a healthy lifestyle through the continued practice of physical activity.

Elements of the Competency	Performance Criteria
1. Plan a personal physical activity program.	• Mention of priorities according to one's needs, abilities, and motivational factors with respect to being sufficiently active on a regular basis • Proper and appropriate formulation of personal objectives • Appropriate choice of physical activity or activities to achieve personal objectives • Appropriate planning of the conditions for performing the physical activity or activities in personal program
2. Combine the elements of a regular and sufficient practice of physical activity as part of a healthy lifestyle.	• Respect for the rules and regulations of the physical activity • Respect for codes of ethics, safety rules and regulations when being physically active • Regular and sufficient practice of a physical activity while maintaining a balance between effectiveness and health-promoting factors
3. Manage a personal physical activity program.	• Appropriate choice of criteria for measuring the attainment of program objectives • Appropriate use of strategies for the quantitative and qualitative evaluation of one's physical activity • Periodic assessment of the time invested and activities practised during the program • Appropriate, periodic and proper adjustment of personal objectives or means used • Meaningful interpretation of the progress made and difficulties encountered in the practice of physical activities • Recognition of the effect of physical activity on one's lifestyle

Learning Activities

Discipline:	Physical Education
Weighting:	1-1-1
Credits:	1

Complementary General Education Component

Social Sciences	Code: 000V

Objective	*Standard*

Statement of the Competency	**Achievement Context**
Estimate the contribution of the social sciences to an understanding of contemporary issues.	• Working alone • In an essay of approximately 750 words on the contribution of the social sciences to an understanding of contemporary issues • Using documents and data from the field of social sciences

Elements of the Competency	**Performance Criteria**
1. Recognize the focus of one or more of the social sciences and their main approaches.	• Formulation of the focus specific to one or more of the social sciences • Description of the main approaches used in the social sciences
2. Identify some of the issues currently under study in the social sciences.	• Association of issues with the pertinent areas of research in the social sciences
3. Demonstrate the contribution of one or more of the social sciences to an understanding of contemporary issues.	• Presentation of contemporary issues by highlighting the interpretation of the social sciences • Illustration of the interaction between certain social changes and the contribution of the social sciences

Learning Activities
Periods of instruction: 45
Credits: 2
Note:

- Use the 300 or 400 series of codes (except codes 300 and 360) to link a course to objective 000V.
- Use code 305 for a multidisciplinary course.
- Codes 340 and 345 may be used, provided the courses are not related to the objectives of common or specific general education.

Social Sciences	Code: 000W
Objective	*Standard*

Statement of the Competency	**Achievement Context**
Analyze one of the major problems of our time using one or more social scientific approaches.	- Working alone - In an essay of approximately 750 words on a topic related to human existence - Using reference materials from the field of social sciences

Elements of the Competency	**Performance Criteria**
1. Formulate a problem using one or more social scientific approaches.	- Presentation of the background to the problem - Use of appropriate concepts and language - Brief description of individual, collective, spatio-temporal and cultural aspects of the problem
2. Address an issue using one or more social scientific approaches.	- Clear formulation of an issue - Selection of pertinent reference materials - Brief description of historical, experimental and survey methods
3. Draw conclusions.	- Appropriate use of the selected method - Determination of appropriate evaluation criteria - Identification of strengths and weaknesses of the conclusions - Broadening of the issue analyzed

Learning Activities
Periods of instruction: 45
Credits: 2
Note:
- Use the 300 or 400 series of codes (except codes 300 and 360) to link a course to objective 000W.   - Use code 305 for a multidisciplinary course.   - Codes 340 and 345 may be used, provided the courses are not related to the objectives of common or specific general education.

Science and Technology	Code: 000X
Objective	*Standard*

Statement of the Competency	**Achievement Context**
Explain the general nature of science and technology and some of the major contemporary scientific or technological issues.	• Working alone • Using a written commentary on a scientific discovery or technological development • In an essay of approximately 750 words

Elements of the Competency	**Performance Criteria**
1. Describe scientific thinking and the standard scientific method.	• Brief description of the essential characteristics of scientific thinking, including quantification and demonstration • Ordered list and brief description of the essential characteristics of the main steps in the standard scientific method
2. Demonstrate how science and technology are complementary.	• Definition of terms and description of the primary ways in which science and technology are interrelated: logical and temporal connections, and mutual contributions
3. Explain the context and the stages related to several scientific and technological discoveries.	• Pertinent and coherent explanation of the relationship between the determining contexts related to several scientific and technological discoveries • Listing of the main stages of scientific and technological discoveries
4. Deduce different consequences and questions resulting from certain recent scientific and technological developments.	• Brief description of important consequences (of different types) and the current major challenges resulting from several scientific and technological discoveries • Formulation of relevant questions and credibility of responses to the questions formulated

Learning Activities
Periods of instruction: 45
Credits: 2
Note: • Use the 100 or 200 series of codes to link a course to objective 000X. • Use code 105 for a multidisciplinary course. • Codes 109, 340 and 345 may be used, provided the courses are not related to the objectives of common or specific general education.

Science and Technology	Code: 000Y

Objective

Standard

Statement of the Competency	**Achievement Context**
Resolve a simple problem by applying the basic scientific method.	• Working alone or in groups • Applying the standard scientific method to a given, simple scientific and technological problem • Using common scientific instruments and reference materials (written or other)

Elements of the Competency	**Performance Criteria**
1. Describe the main steps of the standard scientific method.	• Ordered list and brief description of the characteristics of the steps of the standard scientific method
2. Formulate a hypothesis designed to solve a simple scientific and technological problem.	• Clear, precise description of the problem • Observance of the principles for formulating a hypothesis (observable and measurable nature of data, credibility, etc.)
3. Verify a hypothesis by applying the fundamental principles of the basic experimental method.	• Pertinence, reliability and validity of the experimental method used • Observance of established experimental method • Appropriate choice and use of instruments • Clear, satisfactory presentation of results • Validity of the connections established between the hypothesis, the verification and the conclusion

Learning Activities

Periods of instruction: 45

Credits: 2

Note:

- Use the 100 or 200 series of codes to link a course to objective 000Y.
- Use code 105 for a multidisciplinary course.
- Codes 109, 340 and 345 may be used, provided the courses are not related to the objectives of common or specific general education.

Modern Language	Code: 000Z
Objective	*Standard*

Statement of the Competency	**Achievement Context**

Communicate with limited skill in a modern language.	• For modern Latin-alphabet languages:
	   o during a conversation consisting of at least eight lines of dialogue
	   o in a written text consisting of at least eight sentences
	• For modern non–Latin-alphabet languages:
	   o during a conversation consisting of at least six lines of dialogue
	   o in a written text consisting of at least six sentences
	• Based on learning situations on familiar themes
	• Using reference materials

Elements of the Competency	**Performance Criteria**
1. Understand the meaning of an oral message.	• Accurate identification of words and idiomatic expressions • Clear recognition of the general meaning of simple messages • Logical connection between the various elements of the message
2. Understand the meaning of a written message.	• Accurate identification of words and idiomatic expressions • Clear recognition of the general meaning of simple messages • Logical connection between the various elements of the message
3. Express a simple message orally.	• Appropriate use of language structures in main and coordinate clauses • Appropriate application of grammar rules • Use of verbs in the present indicative • Appropriate use of basic vocabulary and idiomatic expressions • Clear pronunciation • Coherent sequencing of simple sentences • Spontaneous and coherent sequencing of sentences in a conversation
4. Write a text on a given subject.	• Appropriate use of language structures in main and coordinate clauses • Appropriate application of basic grammar rules • Use of verbs in the present indicative • Appropriate use of basic vocabulary and idiomatic expressions • Coherent sequencing of simple sentences • Acceptable application of graphic rules for writing systems that do not use the Latin alphabet

Learning Activities
Periods of instruction: 45
Credits: 2
Note:
• The acquisition of a modern language requires an awareness of the culture of its native speakers.
• "Limited skill" refers to the limited use of language structures, grammar and vocabulary. This limitation varies depending on the complexity of the modern language.
• Use the 600 series of codes to link a course to objective 000Z, with the exception of codes 601, 602, 603 and 604.

Modern Language	Code: 0010
Objective	***Standard***

Statement of the Competency	**Achievement Context**
Communicate on familiar topics in a modern language.	• During a conversation that includes at least 15 lines of dialogue • In a written text consisting of at least 20 sentences for Latin-alphabet languages • In a written text consisting of at least 10 sentences for non-Latin-alphabet languages • Based on: o common situations in everyday life o simple topics from everyday life • Using reference materials

Elements of the Competency	**Performance Criteria**
1. Understand the meaning of an oral message.	• Accurate identification of words and idiomatic expressions • Clear recognition of the general meaning and essential ideas of messages of average complexity • Logical connection between the various elements of the message
2. Understand the meaning of a written message.	• Accurate identification of words and idiomatic expressions • Clear recognition of the general meaning and essential ideas of messages of average complexity • Logical connection between the various elements of the message
3. Express a simple message orally, using sentences of average complexity.	• Appropriate use of language structures in main or subordinate clauses • Appropriate application of grammar rules • Use of verbs in the present indicative • Appropriate use of enriched basic vocabulary and idiomatic expressions • Clear pronunciation • Coherent sequencing of sentences • Dialogue
4. Write a text on a given subject, using sentences of average complexity.	• Appropriate use of language structures in main or subordinate clauses • Appropriate application of grammar rules • Use of verbs in the present and past indicative • Appropriate use of enriched basic vocabulary and idiomatic expressions • Coherent sequencing of sentences of average complexity • Acceptable application of graphic rules for writing systems that do not use the Latin alphabet

Learning Activities
Periods of instruction: 45
Credits: 2
Note:
• The acquisition of a modern language requires an awareness of the culture of its native speakers. • Use the 600 series of codes to link a course to objective 0010, with the exception of codes 601, 602, 603 and 604.

Modern Language	Code: 0067
Objective	***Standard***

Statement of the Competency	**Achievement Context**
Communicate with relative ease in a modern language.	- Working alone - During a conversation consisting of at least 20 lines of dialogue - In a written text of medium length (at least 25 sentences for Latin-alphabet languages and 15 sentences for other languages) - Given documents of a sociocultural nature - Using reference materials for the written text

Elements of the Competency	**Performance Criteria**
1. Understand the meaning of an oral message in everyday language.	- Accurate explanation of the general meaning and essential ideas of the message - Clear identification of structural elements of the language
2. Understand the meaning of a text of average complexity.	- Accurate explanation of the general meaning and essential ideas of the text - Clear identification of structural elements of the language
3. Have a conversation on a subject.	- Appropriate use of the structural elements of the language according to the message to be expressed - Appropriate use of everyday vocabulary - Accurate pronunciation and intonation - Normal flow in a conversation in everyday language - Coherence of the message expressed - Pertinent responses to questions
4. Write a text of average complexity.	- Appropriate use of the structural elements of the language according to the text to be written - Accurate vocabulary - Coherence of the text as a whole - Observance of presentation and writing rules applicable to the text

Learning Activities
Periods of instruction: 45
Credits: 2
Note:
- The acquisition of a modern language requires an awareness of the culture of its native speakers.   - Use the 600 series of codes to link a course to objective 0067, with the exception of codes 601, 602, 603 and 604.

Mathematics Literacy and Computer Science	Code: 0011
Objective	*Standard*

Statement of the Competency	**Achievement Context**
Recognize the role of mathematics or computer science in contemporary society.	• Working alone • In an essay of approximately 750 words • Using different personally selected concrete examples

Elements of the Competency	**Performance Criteria**
1. Demonstrate the acquisition of basic general knowledge of mathematics or computer science.	• Identification of basic notions and concepts • Identification of the main branches of mathematics or computer science • Appropriate use of terminology
2. Describe the evolution of mathematics or computer science.	• Descriptive summary of several major phases
3. Recognize the contribution of mathematics or computer science to the development of other areas of knowledge.	• Demonstration of the existence of important contributions, using concrete examples
4. Illustrate the diversity of mathematical or computer science applications.	• Presentation of a range of applications in various areas of human activity, using concrete examples
5. Evaluate the impact of mathematics or computer science on individuals and organizations.	• Identification of several major influences • Explanation of the way in which mathematics or computer science have changed certain human and organizational realities • Recognition of the advantages and disadvantages of these influences

Learning Activities
Periods of instruction: 45
Credits: 2
Note:
• Only the following codes can be used to link a course to objective 0011: 105, 201, 204, 420.   • Use code 204 for a multidisciplinary course.   • Codes 340 and 345 may be used, provided the courses are not related to the objectives of common or specific general education.

Mathematics Literacy and Computer Science	Code: 0012

Objective | ## *Standard*

Statement of the Competency	**Achievement Context**
Use various mathematical or computer science concepts, procedures and tools for common tasks.	• Working alone • While carrying out a task or solving a problem based on everyday needs • Using familiar tools and reference materials

Elements of the Competency	**Performance Criteria**
1. Demonstrate the acquisition of basic functional knowledge in mathematics or computer science.	• Brief definition of concepts • Correct execution of basic operations • Appropriate use of terminology
2. Select mathematical or computing tools and procedures on the basis of specific needs.	• Listing of numerous possibilities available through the use of mathematical and computing tools and procedures • Analysis of concrete situations and recognition of the usefulness of mathematical or computing tools and procedures • Appropriate choice according to needs
3. Use mathematical or computing tools and procedures to carry out tasks and solve problems.	• Use of a planned and methodical process • Correct use of tools and procedures • Satisfactory results, given the context • Appropriate use of terminology specific to a tool or procedure
4. Interpret the quantitative data or results obtained using mathematical or computing tools and procedures.	• Accurate interpretation, given the context • Clear, precise formulation of the interpretation

Learning Activities

Periods of instruction: 45

Credits: 2

Note:
• Only the following codes can be used to link a course to objective 0012: 105, 201, 204 and 420.
• Use code 204 for a multidisciplinary course.
• Codes 340 and 345 may be used, provided the courses are not related to the objectives of common or specific general education.

Art and Aesthetics	Code: 0013

Objective

Standard

Statement of the Competency	**Achievement Context**
Consider various forms of art produced according to aesthetic practices.	• Working alone • Given a specified work of art • In a written commentary of approximately 750 words

Elements of the Competency	**Performance Criteria**
1. Develop an appreciation for the dynamics of the imagination in art.	• Precise explanation of a creative process connected to the construction of an imaginary universe
2. Describe art movements.	• Descriptive list of the main characteristics of three art movements from different eras, including a modern movement
3. Give a commentary on a work of art.	• Coherent organization of observations, including identification of four fundamental elements of form and structure related to the language used as well as a reasoned description of the meaning of the work of art

Learning Activities
Periods of instruction: 45
Credits: 2
Note: • Use the 500 series of codes (except 502) to link a course to objective 0013. • Use code 504 for a multidisciplinary course. • Codes 340, 345, 601, 602, 603 and 604 may be used, provided the courses are not related to the objectives of common or specific general education.

Art and Aesthetics	Code: 0014

Objective

Standard

Statement of the Competency	Achievement Context
Produce a work of art.	• Working alone • During a practical exercise • In the context of creating or interpreting a work of art • Using the basic elements of the language and techniques specific to the medium selected

Elements of the Competency	Performance Criteria
1. Recognize the primary forms of expression of an artistic medium.	• Identification of specific features: originality, essential qualities, means of communication, styles, genres
2. Use the medium.	• Personal, coherent use of elements of language • Satisfactory application of artistic techniques • Compliance with the requirements of the method of production

Learning Activities
Periods of instruction: 45
Credits: 2
Note:

- Use the 500 series of codes to link a course to objective 0014, with the exception of code 502.
- Use code 504 for a multidisciplinary course.
- Codes 340, 345, 601, 602, 603 and 604 may be used, provided the courses are not related to the objectives of common or specific general education.

Contemporary Issues	Code: 021L
Objective	*Standard*

Statement of the Competency	**Achievement Context**
Consider contemporary issues from a transdisciplinary perspective.	• Individually or in groups • Drawing on different fields of knowledge • Using documents and data from various disciplines

Elements of the Competency	**Performance Criteria**
1. Identify major contemporary issues.	• Exploration of various contemporary issues • Description of the main perspectives concerning these issues • Clear formulation of objects to study related to these issues
2. Recognize the specific role of several disciplines in the understanding of an issue.	• Identification of some of the theories used in analyzing the issue • Clear description of the concepts and methods used
3. Demonstrate the contribution of several disciplines to the understanding of an issue.	• Clear formulation of the perspectives of the issue • Precise description of the main contributions of the disciplines • Pertinent explanation of the interaction among various disciplines • Appropriate use of language and concepts from the disciplines

Learning Activities
Periods of instruction: 45
Credits: 2
Note: • This objective lends itself to teaching by one or more teachers.   • Use code 365 to link a course to objective 021L in order to maintain the transdisciplinary nature of the competency.

Contemporary Issues	Code: 021M

Objective	*Standard*

Statement of the Competency	**Achievement Context**
Explore a contemporary issue from a transdisciplinary perspective.	• Individually or in groups • Drawing on different fields of knowledge • Using documents and data from various disciplines

Elements of the Competency	**Performance Criteria**
1. Present a research problem.	• Justification of the choice of research problem • Brief description of the main issues involved in the problem • Clear formulation of the main dimensions of the problem • Appropriate use of language and concepts from the disciplines • Clear formulation of the research question
2. Analyze the research problem.	• Relevant description of a research approach or method • Appropriate selection of research data • Proper application of the approach or method used • Appropriate use of an analytical framework
3. Propose solutions.	• Clear description of the main contributions from the disciplines • Pertinent explanation of the interaction among various disciplines • Justification of solutions proposed • Assessment of the strengths and weaknesses of the proposed solutions

Learning Activities
Periods of instruction:　　　　45
Credits:　　　　2
Note:
• This objective lends itself to teaching by one or more teachers. • Use code 365 to link a course to objective 021M in order to maintain the transdisciplinary nature of the competency.

Additional Information

Key Terms Used in Pre-University Programs

Program

A program is an integrated set of learning activities leading to the achievement of educational objectives based on set standards.

Aim

The aim encompasses all of the academic fields identified in a pre-university program in order to prepare students for university. As a whole, the elements of a program—i.e. the aims of college education, common competencies, goals, objectives and standards—help students meet the educational requirements of these academic fields.

Goals

The goals of a pre-university program highlight what the students should learn. Program goals contribute to program coherence, which in turn promotes the integration and transfer of learning. They are in keeping with the program-based approach in that they serve to harmonize the program-specific and the general education components, and give concrete expression to the aim of the program.

Competency

A competency is the ability to act. It includes knowledge, skills and attitudes and refers to the student's demonstrated ability to use his or her knowledge and skills in a given situation.

Objectives

The objectives of pre-university programs determine the results expected of the students. It is by attaining objectives and meeting set standards that the students master the college-level competencies that are deemed essential to successful university studies. In pre-university programs, each objective is formulated in terms of a statement of the competency and its elements.

Standard

A standard is the level of performance at which an objective is considered to be achieved. It is by attaining objectives and meeting the required standards that the students master the college-level competencies that are deemed essential to successful university studies. In pre-university programs, each standard is formulated in terms of performance criteria.

Statement of the competency

The statement of the competency specifies the overall training objective associated with a competency; it is based on expectations identified in an analysis of university education and general education needs.

Elements of the competency

The elements specify the essential components of a competency. They include only what is necessary in order to understand and develop the competency.

Performance criteria

The performance criteria define the requirements for recognition of attainment of a standard. They are not an evaluation framework per se, but may serve to develop one. Performance criteria must be taken into account in the evaluation of competency development.

Learning activities

The aspects of learning activities that the Minister can determine, in whole or in part, in a pre-university program include: the field of studies, the discipline(s), the course weighting, the number of periods of instruction, the number of credits, and such specific indications as are deemed essential.

Common objectives and standards

Common objectives and standards determine the core learning content for pursuing university studies in a given field, no matter what specialization a student may have taken.

Objectives and standards of an option

The objectives and standards of an option expose students to an academic field in order to guide them in their university course selection.

Optional objectives and standards

Optional objectives and standards may or may not be implemented by a college. They serve to develop learning activities based on local orientations.

Harmonization of Pre-University Programs and General Education

The harmonization of pre-university programs and general education is part of a lifelong learning approach that makes it easier for college-level students to switch from one pre-university program to another without having to repeat activities for which they have already obtained credit.

Additional information on the [Harmonization of Pre-University Programs and General Education](#) is available on the [quebec.ca](#) website.