Engineering Physics Technology (244.A0)

College Education Program

Sector 09 – Electrotechnology

Version 2014

Québec

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Ministère de l'Éducation et de l'Enseignement supérieur.

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Please note the modifications that have been made to the program of study

Engineering Physics Technology – 244.A0

The modification made involved a change to the name of the program from “Applied Physics Technology” to “Engineering Physics Technology.”

Change approved in 2014

The modification made involved a change to the special admission conditions:

To be admitted to the program, a person must meet the general requirements for admission set out in the *College Education Regulations*, Section 2, as well as the following special conditions, where applicable:

Must have passed the following secondary level courses:

- Secondary V Mathematics Technical and Scientific option **or** Science option
- Secondary IV Environmental Science and Technology **or** Science and the Environment

Change approved in 2009

244.A0 **Engineering Physics Technology**

Type of certification: Diploma of College Studies

Number of credits: 91 2/3

Total duration: 2 790 hours of instruction

General education components:	660	hours of instruction
Program-specific component:	2 130	hours of instruction

Prerequisites: The following secondary-level courses:

- Secondary V Mathematics Technical and Scientific or Science Options
- Secondary IV Environmental Science and Technology or Science and the Environment

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INTRODUCTION TO THE PROGRAM

The *Engineering Physics Technology* program is in keeping with the aims and orientations of technical education that guide the Direction générale des programmes et du développement. It has been designed in accordance with the framework for developing technical programs, which requires participation by people working in the field and in the education community.

This program is based on competencies, formulated in terms of objectives and standards. It was designed using an approach that takes into account training needs, the job analysis and the general goals of technical education, and it serves as the basis for the definition and evaluation of learning activities. In addition, it lends itself to the application of the program-based approach.

The *Engineering Physics Technology* program includes a general education component common to all programs (16 2/3 credits), a general education component adapted to this program (6 credits), a complementary general education component (4 credits) and a program-specific component of 65 credits.

This document has two parts. Part One presents an overview of the program, and Part Two describes the objectives and standards for the general education components and the program-specific component.

GLOSSARY

Program

An integrated set of learning activities leading to the achievement of educational objectives based on set standards (*College Education Regulations,* section 1).

Competency

In the program-specific component of a technical program: an integrated set of cognitive and psychomotor skills and socioaffective behaviours that enable a student to exercise a role or function, perform a task or carry out an activity at entry level on the job market (*Cadre technique d'élaboration de la partie ministérielle des programmes d'études techniques,* p. 3).

Objective

The competency, skills or knowledge to be acquired or mastered (*College Education Regulations,* section 1).

Statement of the competency

In the program-specific component of a technical program, the statement of the competency is the result of the job analysis, the general goals of technical education and, in certain cases, other determinants. It consists of an action verb and a complement. It must be clear and unequivocal.

In the general education components, the statement of the competency is the result of an analysis of the needs of general education.

Elements of the competency

In the program-specific component of a technical program, the elements of the competency include only what is necessary in order to understand the competency. They specify the major steps in exercising the competency or the main aspects of the competency.

In the general education components, the elements of the objective, formulated in terms of a competency, specify the main aspects of the competency. They include only what is necessary in order to understand and attain the competency.

Standard

The level of performance at which an objective is considered to be achieved (*College Education Regulations*, section 1).

Achievement context

In the program-specific component of a technical program, the achievement context corresponds to the situation in which the competency is exercised at entry level on the job market. The achievement context does not specify the context for learning or evaluation.

Performance criteria

In the program-specific component of a technical program, the performance criteria define requirements by which to judge the attainment of each element of the competency and consequently of the competency itself. The performance criteria are based on the requirements at entry level on the job market. The performance criteria are not the evaluation instrument but, rather, they serve as a reference for the development of the evaluation instrument. Each element of the competency requires at least one performance criterion.

In the general education components, the performance criteria define the requirements for recognition of the attainment of the standard. All the criteria must be respected for the objective to be recognized as having been attained.

Learning activities

In the program-specific component of a technical program, the learning activities are classes (or labs, workshops, seminars, practicums or other educational activities) designed to ensure the attainment of the targeted objectives and standards. Colleges are entirely responsible for defining the learning activities and applying the program-based approach.

In the general education components, the elements of the learning activities that may be determined in whole or in part by the Minister are the field of study, the discipline(s), the weightings, the total hours of instruction, the number of credits and any details deemed essential.

PART ONE

GOALS OF THE PROGRAM

The goal of the *Engineering Physics Technology* program is to provide individuals with the training necessary to fulfill the functions of an applied physics technologist.

Applied physics technologists perform design and development tasks in private and government research laboratories, in companies producing high-technology components or equipment, in engineering firms and in university laboratories.

The main tasks of applied physics technologists are to participate in the design and development of applied physics components and equipment prototypes, to perform characterization tests and to contribute to improving production procedures. Applied physics technologists are also responsible for laboratory and production site set-up and management as well as for providing technical assistance to production personnel, clients and students. The technologists must stay up to date with current technology and ensure its transfer.

Applied physics technologists work in applied physics sectors such as: optics, photonics, acoustics, vacuum techniques, micro-electronic and integrated optics component production, non-destructive testing and materials physics. They are specialists in the measurement of physical quantities.

Applied physics technologists use lasers, optics assemblies, spectrometers, radiation sources and detectors, fibre optics, integrated optics components, fusion splicers, vacuum systems, engravers, micro-positioning systems, sound-level meters and spectrum analyzers. In addition, these technologists use their knowledge of electronics and computer science on a daily basis.

They work in offices, laboratories, clean rooms as well as at sites producing applied physics materials, components and equipment.

Applied physics technologists work closely with research scientists, engineers, physicists and other technologists. In addition, they may also supervise technologists, technicians and workers in specialized fields.

In keeping with the general goals of technical education, the program-specific component of the *Engineering Physics Technology* program is designed to :

1- enable students to acquire competence in the exercise of the profession, i.e. carrying out the tasks and activities of the profession at the level required for entry into the job market;

2- help students integrate into the working world by familiarizing them with the job market in general and the specific context of the selected profession;

3- foster the students' personal growth and encourage their continuing professional development;

4- ensure students' future job mobility by helping them to acquire career-management skills.

The *Engineering Physics Technology* program also fulfills the educational intentions of the common, specific and complementary general education components.

Upon finishing their training, the students will have acquired a solid knowledge of physics and related technologies as well as of signal processing electronics and programming.

To increase the versatility of the future applied physics technologists, the learning activities connected with the Engineering Physics Technology program must as often as possible :

- sensitize students to technological change;
- require students to provide physical interpretations of the phenomena studied;
- result in the production of complete and functional prototypes;
- cover as many applied physics fields as feasible.

GOALS OF GENERAL EDUCATION

In Québec, college is the next stage after the compulsory years of schooling (elementary and secondary school) during which students acquire basic knowledge and skills. It represents a major crossroads in that it places greater emphasis on the cultural content of education and leads directly to the job market or to university. The college system meets current needs with respect to technical and pre-university education. It allows students to further their education without narrowing their options, since they may switch from one type of program to the other. Finally, it provides students with a well-rounded, balanced education.

General education is an integral part of every program and comprises three components: a component common to all programs, a component adapted to the particular program and a complementary component. The aim of general education is to provide students with a common cultural core, to help them learn and develop generic skills, and to foster desirable attitudes. Its purpose is to educate students as individuals, to prepare them for their role as responsible members of society and to enable them to share in the common cultural heritage.

Common cultural core

The common cultural core comprises the following :

- mastery of the language of instruction as a tool for communication and reflection, and mastery of the basic rules of rational thought, discourse and argumentation;
- the ability to communicate in another language, primarily French or English
- openness to the world and to cultural diversity;
- appreciation of the riches of our cultural heritage through awareness of the accomplishments of human civilization;
- the ability to relate to major currents in the history of human thought;
- the ability to think independently and critically;
- personal and social ethics;
- knowledge concerning the development of physical and intellectual well-being;
- awareness of the need to develop habits conducive to good health.

Generic skills

General education allows students to acquire and develop the following generic skills :

- conceptualization, analysis and synthesis;
- coherent reasoning;
- critical judgment;
- articulate expression;
- the ability to apply what they have learned to the analysis of situations;
- the ability to apply what they have learned to decision making;
- work methods;
- the ability to reflect on what they have learned.

Desirable attitudes

The common cultural core and generic skills help students to acquire and develop the following attitudes :

- autonomy;
- a critical sense;
- awareness of their responsibilities toward themselves and others;
- open-mindedness;
- creativity;
- openness to the world.

These aims apply to the three general education components :

General education component common to all programs, which is allotted 16 2/3 credits distributed as follows :

- language of instruction and literature: 7 1/3 credits;
- humanities or *philosophie*: 4 1/3 credits;
- physical education: 3 credits;
- second language: 2 credits.

General education component adapted to programs, which introduces tasks or learning situations that are relevant to the program-specific component of a program. The breakdown of credits, for a total of 6, is as follows :

- language of instruction and literature: 2 credits;
- humanities or *philosophie*: 2 credits;
- second language: 2 credits.

Complementary general education component, which provides students with learning activities chosen to balance their training and complement the program-specific component. Students may choose courses for a total of 4 credits in the following areas :

- social sciences;
- science and technology;
- modern languages;
- mathematics literacy and computer science;
- art and aesthetics.

The knowledge and skills acquired in the general education components should be emphasized and, whenever possible, applied in the program-specific component, and vice-versa. Thus, general education and the program-specific component of a program enhance each other as they contribute to the students' overall education.

Each college-level institution must provide general education through learning activities that are consistent with its educational project, in keeping with the aims, subject areas and ministerial guidelines provided.

The objectives and standards in the general education components were developed according to the provisions of the *College Education Regulations* (R.S.Q., c. C-29, s. 18; 1993, c. 25, s. 11). Revised Edition, October 2001.

EDUCATIONAL INTENTIONS OF GENERAL EDUCATION

The educational intentions describe how each field of studies in the common, adapted and complementary components of general education contributes to achieving the goals of general education. For the common and adapted components, the educational intentions include :

- a general statement of the role of each field of studies;
- the principles underlying this role;
- outcome objectives defining (in terms of knowledge, skills and attitudes) the contribution of each field to the achievement of the goals of general education;
- an explanation of the sequence of objectives and standards.

The full text of the educational intentions may be found at the end of this document.

PROGRAM OBJECTIVES

GENERAL EDUCATION COMPONENT COMMON TO ALL PROGRAMS

(16 2/3 credits)

0004 To analyze and produce various forms of discourse.

0005 To apply a critical approach to literary genres.

0006 To apply a critical approach to a literary theme.

00B2 To apply a logical analytical process to how knowledge is organized and used.

000G To apply a critical thought process to world-views.

0017 Appliquer les notions de base de la communication en français courant.

or

000A Communiquer en français avec une certaine aisance.

or

000B Communiquer avec aisance en français.

or

000C Traiter d'un sujet culturel et littéraire.

0064 To establish the role that being physically active plays amongst the lifestyle behaviours which promote health.

0065 To improve one's effectiveness when practising a physical activity.

0066 To demonstrate one's responsibility for being physically active in a manner which promotes health.

GENERAL EDUCATION COMPONENT ADAPTED TO THIS PROGRAM

(6 credits)

000L To communicate in the forms of discourse appropriate to one or more fields of study.

000U To apply a critical thought process to ethical issues relevant to the field of study.

0018 Appliquer des notions fondamentales de la communication en français, liées à un champ d'études.

or

000Q Communiquer en français dans un champ d'études particulier.

or

000R Communiquer avec aisance en français dans un champ d'études particulier.

or

000S Disserter en français sur un sujet lié au champ d'études.

COMPLEMENTARY GENERAL EDUCATION COMPONENT

(4 credits)

000V To estimate the contribution of the social sciences to an understanding of contemporary issues.

000W To analyze one of the major problems of our time using one or more social scientific approaches.

000X To explain the general nature of science and technology and some of the major contemporary scientific or technological issues.

000Y To resolve a simple problem by applying the basic scientific method.

000Z To communicate with limited skill in a modern language.

0010 To communicate on familiar topics in a modern language.

0067 To communicate with relative ease in a modern language.

0011 To recognize the role of mathematics or informatics in contemporary society.

0012 To use various mathematical or computer concepts, procedures and tools for common tasks.

0013 To consider various forms of art produced by aesthetic practices.

0014 To produce a work of art.

PROGRAM-SPECIFIC COMPONENT

(65 credits)

027A To analyze information on work environments in engineering physics technology.

027B To solve mathematics problems related to applied physics.

027C To troubleshoot an apparatus used in applied physics.

027D To analyze the dynamic and fluid dynamic parts of systems.

027E To characterize a component or an apparatus using geometric optics set-ups.

027F To validate a method of measurement.

027G To assemble applied physics apparatus.

027H To use design and simulation software.

027J To set up a measuring chain.

027K To establish the relationships between atomic models and material properties.

027L To characterize materials.

027M To analyze thermal systems.

027N To characterize a wave, a component or an apparatus using wave optics set-ups.

027P To characterize waves, components or apparatus using guided optics set-ups.

027Q To program a data acquisition and processing system.

027R To set up a positioning system.

027S To characterize a wave, a component or an apparatus using acoustic set-ups.

027T To develop an applied physics apparatus.

027U To develop an applied physics component.

027V To participate in setting up and managing a laboratory or production site.

027W To participate in improving a manufacturing process in an applied physics context.

027X To participate in designing an apparatus or component used in applied physics.

HARMONIZATION

The Ministère de l'Éducation et de l'Enseignement supérieur harmonizes its vocational and technical programs by establishing similarities and continuity between secondary and college-level programs within a particular sector or between sectors, in order to avoid overlap in program offerings, recognize prior learning and facilitate the student's progress.

Harmonization establishes consistency between training programs and is especially important in ensuring that the tasks of a trade or occupation are clearly identified and described. Harmonization makes it possible to identify tasks requiring competencies that are common to more than one program. Even if there are no common competencies, training programs are still harmonized.

Harmonization is said to be "inter-level" when it focuses on training programs at different levels, "intra-level" when it focuses on programs within the same educational level, and "inter-sector" when carried out between programs in various sectors.

An important aspect of harmonization is that it allows the common features of competencies to be identified and updated as needed. Common competencies are those that are shared by more than one program; once acquired in one program, they can be recognized as having been acquired in another. Competencies with exactly the same statement and elements are said to be identical. Common competencies that are not identical but have enough similarities to be of equal value are said to be equivalent.

Harmonization of the Engineering Physics Technology program has resulted in identifying competencies that are shared with other programs. Detailed information on the harmonization of this program and its results are presented in the document entitled Table of harmonized competencies, Technologie du génie physique.

PART TWO

OBJECTIVES AND STANDARDS –
GENERAL EDUCATION COMPONENT
COMMON TO ALL PROGRAMS

GENERAL EDUCATION COMPONENT COMMON TO ALL PROGRAMS : CODE : 0004 LANGUAGE OF INSTRUCTION AND LITERATURE	
OBJECTIVE	STANDARD
Statement of the Competency To analyze and produce various forms of discourse.	
Elements of the Competency	**Performance Criteria**
1 To identify the characteristics and functions of the components of discourse.	1.1 Accurate explanation of the denotation of words.
	1.2 Adequate recognition of the appropriate connotation of words.
	1.3 Accurate definition of the characteristics and function of each component.
2 To determine the organization of facts and arguments of a given discourse.	2.1 Clear and accurate recognition of the main idea and structure.
	2.2 Clear presentation of the strategies employed to develop an argument or thesis.
3 To prepare ideas and strategies for a projected discourse.	3.1 Appropriate identification of topics and ideas.
	3.2 Adequate gathering of pertinent information.
	3.3 Clear formulation of a thesis.
	3.4 Coherent ordering of supporting material.
4 To formulate a discourse.	4.1 Appropriate choice of tone and diction.
	4.2 Correct development of sentences.
	4.3 Clear and coherent development of paragraphs.
	4.4 Formulation of a 750-word discourse.
5 To edit the discourse.	5.1 Thorough revision of form and content.
LEARNING ACTIVITIES	
Discipline: English **Weighting:** 2-2-4, 1-3-4 **Credits:** 2 2/3	

GENERAL EDUCATION COMPONENT COMMON TO ALL PROGRAMS : CODE : 0005 LANGUAGE OF INSTRUCTION AND LITERATURE	
OBJECTIVE	STANDARD
Statement of the Competency To apply a critical approach to literary genres.	
Elements of the Competency	**Performance Criteria**
1 To distinguish genres of literary discourse.	1.1 Clear recognition of the formal characteristics of a literary genre.
2 To recognize the use of literary conventions within a specific genre.	2.1 Accurate recognition of the figurative communication of meaning. 2.2 Adequate explanation of the effects of significant literary and rhetorical devices.
3 To situate a discourse within its historical and literary period.	3.1 Appropriate recognition of the relationship of a text to its period.
4 To explicate a discourse representative of a literary genre.	4.1 Selective use of appropriate terminology. 4.2 Effective presentation of a 1000-word integrated response to a text.
LEARNING ACTIVITIES	
Discipline: English **Weighting:** 2-2-3 **Credits:** 2 1/3	

GENERAL EDUCATION COMPONENT COMMON TO ALL PROGRAMS : CODE : 0006
LANGUAGE OF INSTRUCTION AND LITERATURE

OBJECTIVE	STANDARD
Statement of the Competency To apply a critical approach to a literary theme.	
Elements of the Competency	**Performance Criteria**
1 To recognize the treatment of a theme within a literary text.	1.1 Clear recognition of elements within the text which define and reinforce a theme and its development.
	1.2 Adequate demonstration of the effects of significant literary and rhetorical devices.
2 To situate a literary text within its cultural context.	2.1 Appropriate recognition of a text as an expression of cultural context.
	2.2 Adequate demonstration of the effects of significant literary and rhetorical devices.
3 To detect the value system inherent in a literary text.	3.1 Appropriate identification of expression (explicit/implicit) of a value system in a text.
4 To explicate a text from a thematic perspective.	4.1 Selective use of an appropriate terminology.
	4.2 Effective presentation of a 1000-word integrated response to a text.

LEARNING ACTIVITIES

Discipline: English
Weighting: 2-2-3
Credits: 2 1/3

GENERAL EDUCATION COMPONENT COMMON TO ALL PROGRAMS : HUMANITIES
CODE : 00B2

OBJECTIVE	STANDARD
Statement of the Competency To apply a logical analytical process to how knowledge is organized and used.	
Elements of the Competency	**Performance Criteria**
1 To recognize the basic elements of a field of knowledge.	1.1 Appropriate description of the basic elements. 1.2 Appropriate use of terminology relevant to fields of knowledge.
2 To define the modes of organization and utilization of a field of knowledge.	2.1 Adequate definition of the dimensions, limits, and uses of fields of knowledge.
3 To situate a field of knowledge within its historical context.	3.1 Accurate identification of the main components in the historical development of fields of knowledge. 3.2 Accurate description of the effects of historical development and societal milieu on the limitations and uses of a field of knowledge.
4 To organize the main components into coherent patterns.	4.1 Coherent organization of the main components.
5 To produce a synthesis of the main components.	5.1 Appropriate analysis of the components. 5.2 Coherent synthesis of the main components. 5.3 Appropriate expression, including a significant individual written component, of an analysis of the context, importance and implications of the organization and uses of knowledge.

LEARNING ACTIVITIES

Discipline: Humanities
Weighting: 3-1-3
Credits: 2 1/3

GENERAL EDUCATION COMPONENT COMMON TO ALL PROGRAMS : HUMANITIES CODE : 000G	
OBJECTIVE	STANDARD
Statement of the Competency To apply a critical thought process to world-views.	
Elements of the Competency	**Performance Criteria**
1 To describe world-views.	1.1 Accurate description of a society or group with a distinctive world-view. 1.2 Appropriate use of terminology relevant to these societies or groups.
2 To explain the major ideas, values, and implications of a world-view.	2.1 Adequate explanation of the salient components of a world-view.
3 To organize the ideas, values and experiences of a world-view into coherent patterns.	3.1 Coherent organization of ideas about a world-view. 3.2 Appropriate expression, including a significant individual written component, of an analysis of the context, importance, and implications of world-views.
4 To compare world-views.	4.1 Comparative analysis of these world-views. 4.2 Appropriate inclusion of central elements, relationships, and organizational principles of the societies or groups in the analysis.
LEARNING ACTIVITIES	
Discipline: Humanities **Weighting:** 3-0-3 **Credits:** 2	

FORMATION GÉNÉRALE COMMUNE : LANGUE SECONDE (NIVEAU I) CODE : 0017	
OBJECTIF	STANDARD
Énoncé de la compétence Appliquer les notions de base de la communication en français courant.	
Éléments	**Critères de performance**
1 Dégager le sens d'un message oral simple.	1.1 Repérage précis des difficultés de compréhension du message. 1.2 Utilisation pertinente des techniques d'écoute choisies. 1.3 Distinction précise du sens général et des idées essentielles du message. 1.4 Description précise du sens général et des idées essentielles du message.
2 Émettre un message oral simple.	2.1 Repérage précis des difficultés d'expression. 2.2 Utilisation pertinente des techniques d'expression orales choisies. 2.3 Emploi pertinent du vocabulaire courant. 2.4 Expression intelligible du propos.
3 Dégager le sens d'un texte.	3.1 Repérage précis des difficultés de compréhension du texte. 3.2 Utilisation pertinente des techniques de lecture choisies. 3.3 Distinction claire des principaux éléments du texte. 3.4 Description précise du sens général et des idées essentielles d'un texte de 500 mots.
4 Rédiger un texte simple.	4.1 Repérage précis des difficultés d'écriture. 4.2 Utilisation pertinente des techniques d'écriture choisies. 4.3 Emploi pertinent du vocabulaire courant. 4.4 Formulation claire et cohérente d'un texte de 100 mots.
LEARNING ACTIVITIES	
Discipline : Français, langue seconde **Pondération :** 2-1-3 **Unités :** 2	

FORMATION GÉNÉRALE COMMUNE : LANGUE SECONDE (NIVEAU II) CODE : 000A	
OBJECTIF	STANDARD
Énoncé de la compétence Communiquer en français avec une certaine aisance.	
Éléments	**Critères de performance**
1 Interpréter un texte oral simple de trois minutes en français courant.	1.1 Distinction claire des principaux éléments du texte oral. 1.2 Explication précise du sens des mots dans le texte. 1.3 Repérage précis des idées et des sujets traités dans le texte.
2 Produire un texte oral planifié de cinq minutes en français courant.	2.1 Emploi pertinent du vocabulaire courant. 2.2 Respect du niveau de langue, du code grammatical et des règles de la prononciation. 2.3 Formulation claire et cohérente du propos.
3 Interpréter un texte écrit en français courant.	3.1 Distinction claire des principaux éléments du texte. 3.2 Explication précise du sens des mots dans le texte. 3.3 Repérage précis des idées principales et de la structure d'un texte de 700 à 1000 mots.
4 Rédiger un texte simple en français courant.	4.1 Respect du code grammatical et orthographique. 4.2 Utilisation judicieuse des principaux éléments du corpus. 4.3 Formulation claire et cohérente des phrases. 4.4 Articulation cohérente des paragraphes. 4.5 Rédaction d'un texte de 200 mots.

LEARNING ACTIVITIES

Discipline : Français, langue seconde
Pondération : 2-1-3
Unités : 2

FORMATION GÉNÉRALE COMMUNE : LANGUE SECONDE (NIVEAU III) CODE : 000B	
OBJECTIF	STANDARD
Énoncé de la compétence Communiquer avec aisance en français.	
Éléments	**Critères de performance**
1 Produire un texte oral planifié de cinq minutes de complexité moyenne.	1.1 Emploi pertinent du vocabulaire courant. 1.2 Adaptation à l'interlocuteur ou à l'interlocutrice. 1.3 Respect du niveau de langue, du code grammatical et des règles de la prononciation. 1.4 Formulation claire et cohérente du propos. 1.5 Agencement pertinent des idées.
2 Commenter un texte écrit de complexité moyenne.	2.1 Distinction claire des principaux éléments d'un texte comprenant entre 2 500 et 3 000 mots. 2.2 Explication précise du sens des mots dans le texte. 2.3 Distinction précise des idées principales et secondaires, des faits et des opinions. 2.4 Formulation d'éléments implicites.
3 Rédiger un texte de complexité moyenne.	3.1 Respect du code grammatical et orthographique. 3.2 Adaptation au lecteur ou à la lectrice. 3.3 Utilisation judicieuse des principaux éléments du corpus. 3.4 Formulation claire et cohérente des phrases, dont au moins trois sont complexes. 3.5 Articulation cohérente des paragraphes. 3.6 Rédaction d'un texte de 350 mots.
LEARNING ACTIVITIES	
Discipline : Français, langue seconde **Pondération :** 2-1-3 **Unités :** 2	

FORMATION GÉNÉRALE COMMUNE : LANGUE SECONDE (NIVEAU IV) CODE : 000C	
OBJECTIF	STANDARD
Énoncé de la compétence Traiter d'un sujet culturel et littéraire.	
Éléments	**Critères de performance**
1 Analyser un texte culturel ou littéraire.	1.1 Formulation personnelle des éléments principaux du texte. 1.2 Inventaire des thèmes principaux. 1.3 Relevé d'indices qui permettent de situer le texte dans son contexte socioculturel et historique. 1.4 Repérage des valeurs véhiculées. 1.5 Repérage juste de la structure du texte. 1.6 Articulation claire d'un point de vue personnel.
2 Rédiger un texte sur un sujet culturel ou littéraire.	2.1 Respect du sujet. 2.2 Respect du code grammatical et orthographique. 2.3 Adaptation au lecteur ou à la lectrice. 2.4 Utilisation judicieuse des principaux éléments du corpus. 2.5 Formulation claire et cohérente d'un texte de 500 mots. 2.6 Articulation claire d'un point de vue personnel.
LEARNING ACTIVITIES	
Discipline : Français, langue seconde **Pondération :** 3-0-3 **Unités :** 2	

GENERAL EDUCATION COMPONENT COMMON TO ALL PROGRAMS :
PHYSICAL EDUCATION CODE : 0064

OBJECTIVE	STANDARD
Statement of the Competency To establish the role that being physically active plays amongst the lifestyle behaviours which promote health.	
Elements of the Competency	**Performance Criteria**
1 To establish the relationship between one's lifestyle and one's health.	1.1 Proper use of documentation. 1.2 Appropriate relationships between the main lifestyle behaviours and their impact on health.
2 To be physically active in a manner which promotes health.	2.1 Observance of the rules involved in the physical activity, including safety guidelines. 2.2 Respect of one's abilities when practising physical activities.
3 To recognize one's needs, abilities, and motivational factors with respect to being physically active on a regular basis.	3.1 Appropriate use of the physical quantitative and qualitative data. 3.2 Statement of one's main physical needs and abilities. 3.3 Statement of one's main motivational factors with respect to being physically active on a regular basis.
4 To propose physical activities which promote health.	4.1 Appropriate and justified choice of physical activities according to one's needs, abilities, and motivational factors.

LEARNING ACTIVITIES

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

GENERAL EDUCATION COMPONENT COMMON TO ALL PROGRAMS :
PHYSICAL EDUCATION CODE : 0065

OBJECTIVE	STANDARD
Statement of the Competency To improve one's effectiveness when practising a physical activity.	
Elements of the Competency	**Performance Criteria**
1 To use a process designed to improve one's effectiveness in the practice of a physical activity.	1.1 Initial assessment of one's abilities and attitudes when practising a physical activity. 1.2 Statement of one's expectations and needs with respect to one's ability to practise the activity. 1.3 Appropriate formulation of personal objectives. 1.4 Statement of the means to achieve one's objectives. 1.5 Observance of the rules involved in the physical activity, including safety guidelines. 1.6 Periodic evaluation of one's abilities and attitudes when practising a physical activity. 1.7 Meaningful interpretation of the progress achieved and the difficulties experienced during the activity. 1.8 Pertinent and periodic adjustments of objectives or action plan. 1.9 Appreciable improvement of the motor skills required by the activity.

LEARNING ACTIVITIES

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

GENERAL EDUCATION COMPONENT COMMON TO ALL PROGRAMS :
PHYSICAL EDUCATION CODE : 0066

OBJECTIVE	STANDARD
Statement of the Competency To demonstrate one's responsibility for being physically active in a manner which promotes health.	
Elements of the Competency	**Performance Criteria**
1 To combine effective practice with a health promotional approach to physical activity.	1.1 Integration of effective practice with factors which promote health in the practice of a physical activity.
2 To manage a personal physical activity program.	2.1 Statement of one's priorities according to the needs, abilities, and motivational factors with respect to being active on a regular basis. 2.2 Proper formulation of objectives to achieve in one's personal program. 2.3 Appropriate choice of activity or activities for one's personal program. 2.4 Appropriate planning of how the activity or activities in the personal program are carried out. 2.5 Appropriate choice of criteria to measure program objective attainment. 2.6 Periodic statement of the time invested and the activities carried out during the program. 2.7 Meaningful interpretation of the progress achieved and difficulties experienced during the activity. 2.8 Appropriate and periodic adjustment of objectives or action plan.

LEARNING ACTIVITIES

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

OBJECTIVES AND STANDARDS –
GENERAL EDUCATION COMPONENT
ADAPTED TO THIS PROGRAM

GENERAL EDUCATION COMPONENT ADAPTED TO THIS PROGRAM : CODE : 000L
LANGUAGE OF INSTRUCTION AND LITERATURE

OBJECTIVE	STANDARD
Statement of the Competency To communicate in the forms of discourse appropriate to one or more fields of study.	
Elements of the Competency	**Performance Criteria**
1 To identify the forms of discourse appropriate to given fields of study.	1.1 Accurate recognition of specialized vocabulary and conventions.
	1.2 Accurate recognition of the characteristics of the form of discourse.
2 To recognize the discursive frameworks appropriate to given fields of study.	2.1 Clear and accurate recognition of the main ideas and structure.
	2.2 Appropriate distinction between fact and argument.
3 To formulate a discourse.	3.1 Appropriate choice of tone and diction.
	3.2 Correctly developed sentences.
	3.3 Clearly and coherently developed paragraphs.
	3.4 Appropriate use of program-related communication strategies.
	3.5 Formulation of a 1000-word discourse.
	3.6 Thorough revision of form and content.

LEARNING ACTIVITIES

Discipline: English
Total Contact Hours: 60
Credits: 2

GENERAL EDUCATION COMPONENT ADAPTED TO THIS PROGRAM : HUMANITIES
CODE : 000U

OBJECTIVE	STANDARD
Statement of the Competency To apply a critical thought process to ethical issues relevant to the field of study.	
Elements of the Competency	**Performance Criteria**
1 To situate significant ethical issues, in appropriate world-views and fields of knowledge.	1.1 Accurate recognition of the basic elements of ethical issues. 1.2 Appropriate use of relevant terminology. 1.3 Adequate identification of the main linkages with world-views and fields of knowledge.
2 To explain the major ideas, values, and social implication of ethical issues.	2.1 Adequate description of the salient components of the issues.
3 To organize the ethical questions and their implications into coherent patterns.	3.1 Coherent organization of the ethical questions and their implications. 3.2 Appropriate expression, including a significant individual written component, of an analysis of the context, importance and implications of the issues.
4 To debate the ethical issues.	4.1 Adequate development of substantiated argumentation including context and diverse points of view. 4.2 Clear articulation of an individual point of view.

LEARNING ACTIVITIES

Discipline: Humanities
Total Contact Hours: 45
Credits: 2

FORMATION GÉNÉRALE PROPRE : LANGUE SECONDE (NIVEAU I)	CODE : 0018
OBJECTIF	STANDARD
Énoncé de la compétence Appliquer des notions fondamentales de la communication en français, liées à un champ d'études.	
Éléments	**Critères de performance**
1 Dégager le sens d'un message oral simple lié à un champ d'études.	1.1 Repérage précis des difficultés de compréhension du message. 1.2 Distinction juste des caractéristiques du message. 1.3 Repérage juste du vocabulaire spécialisé. 1.4 Utilisation pertinente des techniques d'écoute choisies. 1.5 Distinction claire des principaux éléments du message. 1.6 Description précise du sens général et des idées essentielles du message.
2 Dégager le sens et les caractéristiques d'un texte lié à un champ d'études.	2.1 Repérage précis des difficultés de compréhension du texte. 2.2 Distinction juste des caractéristiques du texte. 2.3 Repérage précis du vocabulaire spécialisé. 2.4 Utilisation pertinente des techniques de lectures choisies. 2.5 Distinction claire des principaux éléments du texte. 2.6 Description précise du sens général et des idées essentielles du texte.
3 Émettre un message oral simple lié à un champ d'études.	3.1 Repérage précis des difficultés d'expression orale. 3.2 Utilisation pertinente des techniques d'expression orale choisies. 3.3 Utilisation pertinente du vocabulaire courant et spécialisé. 3.4 Expression intelligible du propos.
4 Rédiger un court texte lié à un champ d'études.	4.1 Repérage précis des difficultés d'écrire. 4.2 Utilisation pertinente des techniques d'écriture choisies. 4.3 Utilisation pertinente du vocabulaire courant et spécialisé. 4.4 Formulation claire et cohérente du texte.
ACTIVITÉS D'APPRENTISSAGE	
Discipline : Français, langue seconde **Nombre d'heures-contact :** 45 **Nombre d'unités :** 2	

FORMATION GÉNÉRALE PROPRE : LANGUE SECONDE (NIVEAU II)	CODE : 000Q
OBJECTIF	STANDARD
Énoncé de la compétence Communiquer en français dans un champ d'études particulier.	
Éléments	**Critères de performance**
1 Distinguer les types de textes propres au champ d'études.	1.1 Distinction précise des caractéristiques formelles de chacun des principaux types de textes et des conventions utilisées.
2 Interpréter des textes représentatifs du champ d'études.	2.1 Distinction claire des principaux éléments du texte.
	2.2 Interprétation claire du vocabulaire spécialisé.
	2.3 Repérage précis des idées et des sujets traités.
	2.4 Utilisation pertinente des techniques de lecture et d'écoute.
3 Utiliser des techniques de production de textes appropriées au champ d'études.	3.1 Emploi pertinent du vocabulaire spécialisé et des conventions.
	3.2 Respect du niveau de langue et du code grammatical.
	3.3 Formulation claire et cohérente du propos.
	3.4 Utilisation pertinente des techniques d'expression.

ACTIVITÉS D'APPRENTISSAGE

Discipline : Français, langue seconde
Nombre d'heures-contact : 45
Nombre d'unités : 2

FORMATION GÉNÉRALE PROPRE : LANGUE SECONDE (NIVEAU III)	CODE : 000R
OBJECTIF	STANDARD
Énoncé de la compétence Communiquer avec aisance en français dans un champ d'études particulier.	
Éléments	**Critères de performance**
1 Commenter des textes propres au champ d'études.	1.1 Distinction précise des caractéristiques formelles des principaux types de textes et des conventions utilisées. 1.2 Explication précise du sens des mots dans le texte. 1.3 Repérage précis de la structure du texte. 1.4 Reformulation juste des idées principales et secondaires, des faits et des opinions. 1.5 Emploi juste du vocabulaire spécialisé.
2 Produire un texte sur un sujet lié au champ d'études.	2.1 Respect du sujet. 2.2 Emploi pertinent du vocabulaire spécialisé et des conventions. 2.3 Respect du niveau de langue et du code grammatical. 2.4 Formulation claire et cohérente du propos. 2.5 Agencement pertinent des idées. 2.6 Adéquation entre forme et fond.

ACTIVITÉS D'APPRENTISSAGE

Discipline : Français, langue seconde
Nombre d'heures-contact : 45
Nombre d'unités : 2

FORMATION GÉNÉRALE PROPRE : LANGUE SECONDE (NIVEAU IV)	CODE : 000S
OBJECTIF	STANDARD
Énoncé de la compétence Disserter en français sur un sujet lié au champ d'études.	
Éléments	**Critères de performance**
1 Analyser un texte lié au champ d'études.	1.1 Distinction précise des caractéristiques formelles des types particuliers de textes. 1.2 Formulation personnelle des éléments principaux. 1.3 Inventaire des thèmes principaux. 1.4 Repérage juste de la structure du texte. 1.5 Relevé d'indices qui permettent de situer le texte dans son contexte. 1.6 Articulation claire d'un point de vue personnel, s'il y a lieu. 1.7 Association juste des éléments du texte au sujet traité.
2 Rédiger un texte sur un sujet lié au champ d'études.	2.1 Respect du sujet. 2.2 Emploi pertinent du vocabulaire spécialisé et des conventions. 2.3 Choix judicieux des principaux éléments du corpus en fonction du type de texte. 2.4 Formulation claire et cohérente du texte. 2.5 Respect du code grammatical et orthographique. 2.6 Articulation claire d'un point de vue personnel, s'il y a lieu.
ACTIVITÉS D'APPRENTISSAGE	
Discipline : Français, langue seconde **Nombre d'heures-contact :** 45 **Nombre d'unités :** 2	

OBJECTIVES AND STANDARDS – COMPLEMENTARY GENERAL EDUCATION COMPONENT

COMPLEMENTARY GENERAL EDUCATION COMPONENT : SOCIAL SCIENCES

CODE : 000V

OBJECTIVE	STANDARD
Statement of the Competency To estimate the contribution of the social sciences to an understanding of contemporary issues.	**Achievement Context** Students will work alone. • They will write an essay of approximately 750 words on the contribution of the social sciences to an understanding of contemporary issues. • Documents and data from the field of social sciences may be used.
Elements of the Competency	**Performance Criteria**
1 Recognize the focus of one or more of the social sciences and their main approaches.	1.1 Formulation of the focus specific to one or more of the social sciences. 1.2 Description of the main approaches used in the social sciences.
2 Identify some of the issues currently under study in the social sciences.	2.1 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.	3.1 Presentation of contemporary issues by emphasizing the interpretation of the social sciences. 3.2 Illustration of the interaction between certain social changes and the contribution of the social sciences.

LEARNING ACTIVITIES

Number of student-contact hours: 45
Number of credits: 2

COMPLEMENTARY GENERAL EDUCATION COMPONENT : SOCIAL SCIENCES

CODE : 000W

OBJECTIVE	STANDARD
Statement of the Competency To analyze one of the major problems of our time using one or more social scientific approaches.	**Achievement Context** • Students will work alone. • They will write an essay of approximately 750 words on a topic related to human existence. • Reference materials from the field of social sciences may be used.
Elements of the Competency	**Performance Criteria**
1 Formulate a problem using one or more social scientific approaches.	1.1 Presentation of the background to the problem. 1.2 Use of appropriate concepts and language. 1.3 Brief description of individual, collective, spatiotemporal and cultural aspects of the problem.
2 Deal with an issue using one or more social scientific approaches.	2.1 Clear formulation of an issue. 2.2 Selection of pertinent reference materials. 2.3 Brief description of historical, experimental and survey methods.
3 Draw conclusions.	3.1 Appropriate use of the selected method. 3.2 Determination of appropriate evaluation criteria. 3.3 Identification of strengths and weaknesses of the conclusions.

LEARNING ACTIVITIES

Number of student-contact hours: 45
Number of credits: 2

COMPLEMENTARY GENERAL EDUCATION COMPONENT :
SCIENCE AND TECHNOLOGY CODE : 000X

OBJECTIVE	STANDARD
Statement of the Competency To explain the general nature of science and technology and some of the major contemporary scientific or technological issues.	**Achievement Context** • Students will work alone. • They will use a written commentary on a scientific discovery or technological development. • They will write an essay of approximately 750 words.
Elements of the Competency	**Performance Criteria**
1 Describe the standard scientific mode of thought and method.	1.1 Brief description of the essential characteristics of the scientific mode of thought, including quantification and demonstration.
	1.2 Organized 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.	2.1 Definition of terms and description of the primary ways in which science, techniques 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.	3.1 Pertinent and coherent explanation of the relationship between the determining contexts related to several scientific and technological discoveries.
	3.2 List of the main stages of scientific and technological discoveries.
4 Deduce different consequences and questions resulting from certain recent scientific and technological developments.	4.1 Brief description of important consequences (of different types) and the current major challenges resulting from several scientific and technological discoveries.
	4.2 Formulation of relevant questions and credibility of responses to the questions formulated.

LEARNING ACTIVITIES

Number of student-contact hours: 45
Number of credits: 2

COMPLEMENTARY GENERAL EDUCATION COMPONENT :
SCIENCE AND TECHNOLOGY CODE : 000Y

OBJECTIVE	STANDARD
Statement of the Competency To resolve a simple problem by applying the basic scientific method.	**Achievement Context** • Students will work alone or in groups. • They will be given a scientific and technological problem that is not complex and that can be resolved by applying the standard scientific method. • Common scientific instruments and reference materials (written or other) may be used.
Elements of the Competency	**Performance Criteria**
1 Describe the main steps of the standard scientific method.	1.1 Organized 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.	2.1 Clear, precise description of the problem. 2.2 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.	3.1 Pertinence, reliability and validity of the experimental method used. 3.2 Observance of established experimental method. 3.3 Appropriate choice and use of instruments. 3.4 Clear, satisfactory presentation of results. 3.5 Validity of the connections established between the hypothesis, the verification and the conclusion.

LEARNING ACTIVITIES

Number of student-contact hours: 45
Number of credits: 2

COMPLEMENTARY GENERAL EDUCATION COMPONENT : MODERN LANGUAGES	CODE : 000Z
OBJECTIVE	STANDARD
Statement of the Competency To communicate with limited skill* in a modern language. (*This refers to the limited use of language structures, grammar and vocabulary. This limitation varies depending on the complexity of the modern language.)	**Achievement Context** For modern languages that use the Latin alphabet, students will: • have a conversation that includes at least 8 lines of dialogue • write a text consisting of at least 8 sentences For modern languages that use a writing system other than the Latin alphabet, students will: • have a conversation that includes at least 6 lines of dialogue • write a text consisting of at least 6 sentences Students will be exposed to learning situations on familiar themes. Reference materials may be used.
Elements of the Competency	**Performance Criteria**
1 Understand the meaning of a verbal message.	The acquisition of a modern language requires an awareness of the culture of the people who use the language. 1.1 Accurate identification of words and idiomatic expressions. 1.2 Clear recognition of the general meaning of simple messages. 1.3 Logical connection between the various elements of the message.
2 Understand the meaning of a written message.	2.1 Accurate identification of words and idiomatic expressions. 2.2 Clear recognition of the general meaning of simple messages. 2.3 Logical connection between the various elements of the message.
3 Express a simple message verbally.	3.1 Appropriate use of language structures in main and coordinate clauses. 3.2 Appropriate application of grammar rules. 3.3 Use of verbs in the present indicative. 3.4 Appropriate use of basic vocabulary and idiomatic expressions. 3.5 Understandable pronunciation. 3.6 Coherent sequence of simple sentences. 3.7 Spontaneous and coherent sequence of sentences during a conversation.
4 Write a text on a given subject.	4.1 Appropriate use of language structures in main and coordinate clauses. 4.2 Appropriate application of basic grammar rules. 4.3 Use of verbs in the present indicative. 4.4 Appropriate use of basic vocabulary and idiomatic expressions. 4.5 Coherent sequence of simple sentences. 4.6 Acceptable application of graphic rules for writing systems other than the Latin alphabet.
LEARNING ACTIVITIES	
Number of student-contact hours: 45 **Number of credits:** 2	

COMPLEMENTARY GENERAL EDUCATION COMPONENT : MODERN LANGUAGES	CODE : 0010
OBJECTIVE	STANDARD
Statement of the Competency To communicate on familiar topics in a modern language.	**Achievement Context** • Students will have a conversation that includes at least 15 lines of dialogue. • They will write a text consisting of at least 20 sentences for Latin-alphabet languages. • They will write a text consisting of at least 10 sentences for languages not using the Latin alphabet. • Students will be exposed to: – common situations in everyday life – simple topics from everyday life • Reference materials may be used.
Elements of the Competency	**Performance Criteria**
1 Understand the meaning of a verbal message.	The acquisition of a modern language requires an awareness of the culture of the people who use the language. 1.1 Accurate identification of words and idiomatic expressions. 1.2 Clear recognition of the general meaning and essential ideas of messages of average complexity. 1.3 Logical connection between the various elements of the message.
2 Understand the meaning of a written message.	2.1 Accurate identification of words and idiomatic expressions. 2.2 Clear recognition of the general meaning and essential ideas of messages of average complexity. 2.3 Logical connection between the various elements of the message.
3 Express a simple message verbally, using sentences of average complexity.	3.1 Appropriate use of language structures in main or subordinate clauses. 3.2 Appropriate application of grammar rules. 3.3 Use of verbs in the present indicative. 3.4 Appropriate use of enriched basic vocabulary and idiomatic expressions. 3.5 Understandable pronunciation. 3.6 Coherent sequence of sentences of average complexity. 3.7 Conversation
4 Write a text on a given subject, using sentences of average complexity.	4.1 Appropriate use of language structures in main or subordinate clauses. 4.2 Appropriate application of grammar rules. 4.3 Use of verbs in the present and past indicative. 4.4 Appropriate use of enriched basic vocabulary and idiomatic expressions. 4.5 Coherent sequence of sentences of average complexity. 4.6 Acceptable application of graphic rules for writing systems other than the Latin alphabet.
LEARNING ACTIVITIES	
Number of student-contact hours: 45 **Number of credits:** 2	

COMPLEMENTARY GENERAL EDUCATION COMPONENT : MODERN LANGUAGES
CODE : 0067

OBJECTIVE	STANDARD
Statement of the Competency To communicate with relative ease in a modern language.	**Achievement Context** • Students will work alone. • They will have a conversation that includes at least 20 lines of dialogue. • They will write a text of medium length (at least 25 sentences for Latin-alphabet languages and 15 sentences for other languages). • They will use documents of a sociocultural nature. Reference materials for the written text may be used.
Elements of the Competency	**Performance Criteria**
1 Understand the meaning of a verbal message in everyday language.	The acquisition of a modern language requires an awareness of the culture of the people who use the language. 1.1 Accurate explanation of the general meaning and essential ideas of the message. 1.2 Clear identification of structural elements of the language.
2 Understand the meaning of a text of average complexity.	2.1 Accurate explanation of the general meaning and essential ideas of the text. 2.2 Clear identification of structural elements of the language.
3 Have a conversation on a subject.	3.1 Appropriate use of the structural elements of the language according to the message to be expressed. 3.2 Appropriate use of everyday vocabulary. 3.3 Accurate pronunciation and intonation. 3.4 Normal flow in a conversation in everyday language. 3.5 Coherence of the message expressed. 3.6 Pertinent responses to questions.
4 Write a text of average complexity.	4.1 Appropriate use of the structural elements of the language according to the text to be written. 4.2 Accurate vocabulary. 4.3 Coherence of the text as a whole. 4.4 Observance of presentation and writing rules applicable to the text.
LEARNING ACTIVITIES	
Number of student-contact hours: 45 **Number of credits:** 2	

COMPLEMENTARY GENERAL EDUCATION COMPONENT :
MATHEMATICS LITERACY AND COMPUTER SCIENCE CODE : 0011

OBJECTIVE	STANDARD
Statement of the Competency To recognize the role of mathematics or informatics in contemporary society.	**Achievement Context** • Students will work alone. • They will write an essay of approximately 750 words, using numerous concrete examples that they themselves will have selected.
Elements of the Competency	**Performance Criteria**
1 Demonstrate the acquisition of basic general knowledge of mathematics or informatics.	1.1 Identification of basic notions and concepts. 1.2 Identification of main branches of mathematics or informatics. 1.3 Appropriate use of terminology.
2 Describe the evolution of mathematics or informatics.	2.1 Descriptive summary of several major phases.
3 Recognize the contribution of mathematics or informatics to the development of other areas of knowledge.	3.1 Demonstration of the existence of important contributions, using concrete examples.
4 Illustrate the diversity of mathematical or informatics applications.	4.1 Presentation of a range of applications in various areas of human activity, using concrete examples.
5 Evaluate the impact of mathematics or informatics on individuals and organizations.	5.1 Identification of several major influences. 5.2 Explanation of the way in which mathematics or informatics have changed certain human and organizational realities. 5.3 Recognition of the advantages and disadvantages of these influences.

LEARNING ACTIVITIES

Number of student-contact hours: 45
Number of credits: 2

COMPLEMENTARY GENERAL EDUCATION COMPENENT :
MATHEMATICS LITERACY AND COMPUTER SCIENCE CODE : 0012

OBJECTIVE	STANDARD
Statement of the Competency To use various mathematical or computer concepts, procedures and tools for common tasks.	**Achievement Context** • Students will work alone. • They will carry out a task or solve a problem based on everyday needs. • Familiar tools and reference materials may be used.
Elements of the Competency	**Performance Criteria**
1 Demonstrate the acquisition of basic functional knowledge in mathematics or informatics.	1.1 Brief definition of concepts. 1.2 Correct execution of basic operations. 1.3 Appropriate use of terminology.
2 Select mathematical or computer tools and procedures on the basis of specific needs.	2.1 List of numerous possibilities available with mathematical and computer tools and procedures. 2.2 Analysis of concrete situations and recognition of the usefulness of mathematical or computer tools and procedures. 2.3 Appropriate choice according to needs.
3 Use mathematical or computer tools and procedures to carry out tasks and solve problems.	3.1 Planned, methodical process. 3.2 Correct use of tools and procedures. 3.3 Satisfactory results, given the context. 3.4 Appropriate use of terminology specific to a tool or procedure.
4 Interpret the quantitative data or results obtained using mathematical or computer tools and procedures.	4.1 Accurate interpretation, given the context. 4.2 Clear, precise formulation of the interpretation.

LEARNING ACTIVITIES

Number of student-contact hours: 45
Number of credits: 2

COMPLEMENTARY GENERAL EDUCATION COMPONENT :
ART AND AESTHETICS CODE : 0013

OBJECTIVE	STANDARD
Statement of the Competency To consider various forms of art produced by aesthetic practices.	**Achievement Context** • Students will work alone. • They will use a specified work of art and write a commentary of approximately 750 words.
Elements of the Competency	**Performance Criteria**
1 Develop an appreciation for the dynamics of the imagination in art.	1.1 Precise explanation of a creative process connected to the construction of an imaginary universe.
2 Describe art movements.	2.1 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.	3.1 Coherent organization of observations, including identification of four fundamental elements of form and structure related to the language used as well as a justified description of the meaning of the work of art.

LEARNING ACTIVITIES

Number of student-contact hours: 45
Number of credits: 2

COMPLEMENTARY GENERAL EDUCATION COMPONENT :
ART AND AESTHETICS CODE : 0014

OBJECTIVE	STANDARD
Statement of the Competency To produce a work of art.	**Achievement Context** • Working alone. • In the context of a practical exercise. • In a context of creation or interpretation. • Based on 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.	1.1 Identification of specific features: originality, essential qualities, means of communication, styles, genres.
2 Use the medium.	2.1 Personal, coherent use of elements of language. 2.2 Satisfactory application of artistic techniques. 2.3 Observance of the requirements of the method of production.

LEARNING ACTIVITIES

Number of student-contact hours: 45
Number of credits: 2

OBJECTIVES AND STANDARDS – PROGRAM-SPECIFIC COMPONENT

CODE: 027A	
OBJECTIVE	STANDARD
Statement of the Competency To analyze information on work environments in engineering physics technology.	**Achievement Context** • Using current laws and regulations.
Elements of the Competency	**Performance Criteria**
1 To research the work environments and the profession of physics technologist.	1.1 Choice of appropriate information sources. 1.2 Reliability and diversity of the information collected. 1.3 Appropriate use of research tools.
2 To analyze information on the work environments.	2.1 Proper identification of companies or establishments. 2.2 Identification of the different professions present. 2.3 Identification of the professional associations and unions present. 2.4 Proper understanding of the importance of technological development. 2.5 Proper analysis of the different forms of work organization. 2.6 Proper analysis of the main characteristics of the products and services offered by the companies or establishments. 2.7 Proper filing of the information.
3 To analyze information on the profession.	3.1 Proper identification of the types of positions. 3.2 Proper analysis of the profession's tasks and responsibilities. 3.3 Identification of work health and safety risks. 3.4 Proper identification of the knowledge and abilities required to exercise the profession. 3.5 Proper understanding of standards and conventions relating to professional ethics. 3.6 Appropriate use of laws and regulations. 3.7 Proper filing of the information.
4 To present the information.	4.1 Proper summary of information. 4.2 Clarity of expression.

CODE: 027B	
OBJECTIVE	STANDARD
Statement of the Competency To solve mathematics problems related to applied physics.	**Achievement Context** • Based on situations in an applied physics context. • Using software.
Elements of the Competency	**Performance Criteria**
1 To model a physical situation.	1.1 Proper analysis of the situation. 1.2 Appropriate choice of an algebraic, graphic or functional block model. 1.3 Appropriate choice of variables. 1.4 Unit coherence. 1.5 Adherence to writing standards.
2 To solve systems of linear equations.	2.1 Correct application of analytic, iterative and graphic solution methods. 2.2 Manipulations according to algebraic rules. 2.3 Accurate calculation.
3 To solve trigonometry problems.	3.1 Identification of the type of triangle. 3.2 Choice and use of appropriate formulas. 3.3 Appropriate use of the unit circle. 3.4 Exact calculation of distances, angles and areas. 3.5 Pertinent and exact unit conversion.
4 To perform vector operations.	4.1 Correct graphic representation of vectors in a plane and space. 4.2 Correct application of vector addition, multiplication and decomposition methods. 4.3 Appropriate use of scalar and vector products. 4.4 Correct algebraic manipulations. 4.5 Accurate calculation.
5 To calculate values of exponential and logarithmic functions.	5.1 Correct graphic representation of functions. 5.2 Correct application of calculation methods. 5.3 Manipulations according to algebraic rules. 5.4 Accurate calculation.

CODE: 027B	
6 To perform complex number operations.	6.1 Correct graphic representation of complex numbers. 6.2 Judicious and correct use of polar, Cartesian and exponential representation. 6.3 Correct application of addition and multiplication techniques. 6.4 Accurate calculation.
7 To calculate time-based sinusoidal functions.	7.1 Correct application of addition and multiplication techniques. 7.2 Adherence to the rules of algebra and trigonometry. 7.3 Correct graphic representation of functions in the time and frequency domains. 7.4 Accurate calculation.
8 To apply differentiation and integration methods.	8.1 Appropriate choice of calculation method. 8.2 Correct application of analytic and numeric calculation methods. 8.3 Manipulations according to algebraic and analytic rules. 8.4 Proper understanding of graphic representations.
9 To present results and justify the problem solving method used.	9.1 Appropriate use of terminology and writing standards. 9.2 Evaluation of the plausibility of the results obtained.

CODE: 027C	
OBJECTIVE	STANDARD
Statement of the Competency To troubleshoot an apparatus used in applied physics.	**Achievement Context** • Using : – measuring instruments; – hand tools; – calibration values; – components required to make repairs; – technical documentation.
Elements of the Competency	**Performance Criteria**
1 To verify that the apparatus functions properly.	1.1 Proper understanding of the user's manual for the apparatus. 1.2 Proper understanding of the specifications of the apparatus. 1.3 Correct application of a verification method. 1.4 Appropriate use of measuring instruments. 1.5 Identification of an operational problem.
2 To operate the apparatus and analyze its functional principle.	2.1 Proper understanding of the apparatus diagrams. 2.2 Correct identification and location of main systems and components. 2.3 Proper analysis of physical principles on which the apparatus operates and on which the involved technologies are based. 2.4 Correct determination of measuring points. 2.5 Appropriate use of measuring instruments and hand tools. 2.6 Appropriate use of technical documentation. 2.7 Observance of occupational health and safety rules.

CODE: 027C	
3 To test the systems of the apparatus.	3.1 Proper understanding of the apparatus diagrams. 3.2 Correct determination of measuring points. 3.3 Correct application of a test method. 3.4 Precise identification of the system in which the failure occurred. 3.5 Appropriate use of measuring instruments. 3.6 Appropriate use of technical documentation. 3.7 Proper inspection using one's sense of sight, hearing, smell and touch. 3.8 Appropriate consultation with resource personnel. 3.9 Observance of occupational health and safety rules.
4 To diagnose functional problems.	4.1 Proper understanding of the apparatus diagrams. 4.2 Correct application of a test method. 4.3 Exact calculation of physical values. 4.4 Precise location of the defective component. 4.5 Correct determination of the nature and cause of the operational problem. 4.6 Appropriate use of measuring instruments. 4.7 Appropriate use of technical documentation. 4.8 Appropriate consultation with resource personnel. 4.9 Observance of occupational health and safety rules.
5 To arrange for repairs or perform them oneself.	5.1 Determination of the corrective measure to apply. 5.2 Proper understanding of the apparatus diagrams. 5.3 Correct application of a method to maintain or replace components. 5.4 Correct and judicious use of a calibration method. 5.5 Appropriate use of measuring instruments. 5.6 Appropriate use of technical documentation. 5.7 Clear record of the information. 5.8 Work restricted to tasks for which one is qualified. 5.9 Observance of occupational health and safety rules.

CODE: 027D	
OBJECTIVE	STANDARD
Statement of the Competency To analyze the dynamic and fluid dynamic parts of systems.	**Achievement Context** • Using : – data acquisition and processing systems; – specialized software; – technical documentation.
Elements of the Competency	**Performance Criteria**
1 To diagram the system.	1.1 Proper description of system elements. 1.2 Correct determination of the system's external limit. 1.3 Proper analysis of contact, frictional and action at a distance forces. 1.4 Proper analysis of translational and rotational movements. 1.5 Choice of a single- or multi-particle system model according to analysis requirements. 1.6 Clear diagram.
2 To measure mechanical values.	2.1 Correct determination of the mechanical values to measure. 2.2 Appropriate choice and use of measuring instruments. 2.3 Correct application of the measurement method. 2.4 Precise measurement of masses, positions, durations, forces, pressures or rates. 2.5 Correct data processing. 2.6 Exact calculation of the value and precision of physical values. 2.7 Appropriate use of a data acquisition and processing system. 2.8 Evaluation of the reasonableness of results obtained.

CODE: 027D	
3 To quantify the effects of forces.	3.1 Correct application of Newton's laws as well as energy and motion conservation laws. 3.2 Correct application of Pascal's and Archimedes' principles and Bernoulli's theorem. 3.3 Correct determination of dynamic and fluid dynamic values. 3.4 Correct determination of conditions for oscillation and resonance. 3.5 Exact calculation of linear or circular trajectories. 3.6 Exact calculation of effects of mechanical forces and power. 3.7 Appropriate use of software. 3.8 Evaluation of the reasonableness of results obtained.

CODE: 027E	
OBJECTIVE	STANDARD
Statement of the Competency To characterize a component or an apparatus using geometric optics set-ups.	**Achievement Context** • For characterizations using an optical test bench or board. • Using : – characterization methods; – geometric optics equipment; – instruments such as verniers, goniometers, collimators, viewers and photometers; – manual or automated positioning and micro-positioning systems; – data acquisition and processing system; – technical documentation; – software.
Elements of the Competency 1 To study the request for characterization.	**Performance Criteria** 1.1 Statement of physical quantities to measure and required precision levels. 1.2 Proper understanding of use, technical specifications and operation of the component or apparatus. 1.3 Proper understanding of the steps and equations involved in the characterization method. 1.4 Appropriate use of technical documentation.

CODE: 027E	
2 To assemble the elements of the characterization set-up.	2.1 Proper understanding of the operation of the elements in the set-up. 2.2 Correct determination of technical specifications of the elements in the set-up. 2.3 Appropriate choice of elements in the set-up. 2.4 Appropriate verification of elements in the set-up. 2.5 Precise positioning of elements in the set-up. 2.6 Appropriate use of alignment and attachment techniques. 2.7 Correct adjustment of optical sources as well as measuring and alignment instruments. 2.8 Appropriate use of methods for carrying out a summary verification of the optical characteristics of elements in the set-up. 2.9 Careful manipulation. 2.10 Judicious use of software. 2.11 Observance of occupational health and safety rules.
3 To take measurements.	3.1 Correct component or apparatus installation. 3.2 Correct application of the steps in the measurement method. 3.3 Correct visual identification of points or zones of the optical beam having particular optical properties. 3.4 Precise measurement of positions, angles and illumination. 3.5 Adequate control of stray light. 3.6 Appropriate use of diaphragms. 3.7 Appropriate use of measuring instruments. 3.8 Appropriate use of manual or automated positioning and micro-positioning systems. 3.9 Judicious use of a data acquisition and processing system. 3.10 Observance of occupational health and safety rules.

CODE: 027E	
4 To characterize the component or apparatus.	4.1 Proper understanding of the relationships between observed optical phenomena, measured optical properties and the laws of reflection and refraction. 4.2 Proper understanding of the relationships between measured properties and the laws of radiometry and photometry. 4.3 Correct processing of position, angle or illumination measurements. 4.4 Exact calculation of the value and precision of physical quantities. 4.5 Appropriate use of software. 4.6 Evaluation of the reasonableness of results obtained.
5 To communicate the results of the characterization.	5.1 Proper description of observed optical phenomena. 5.2 Proper description of optical properties of the component or apparatus. 5.3 Use of appropriate vocabulary. 5.4 Correct writing of the characterization report. 5.5 Detailed and objective presentation of results.

CODE: 027F	
OBJECTIVE	STANDARD
Statement of the Competency To validate a method of measurement.	**Achievement Context** • Using : – set-up; – apparatus and calibration values; – data acquisition and processing system; – software; – technical documentation.
Elements of the Competency	**Performance Criteria**
1 To analyze the measuring method versus the level of precision required.	1.1 Proper understanding of metrological terminology. 1.2 Proper understanding of the theoretical principles and equations associated with the measurement method. 1.3 Proper understanding of the limits of using the method in both static and dynamic modes. 1.4 Proper understanding of the conditions under which the steps in the method should be performed. 1.5 Proper analysis of measurable physical quantities and influencing quantities.
2 To prepare to take measurements.	2.1 Appropriate verification and use of measuring instruments. 2.2 Appropriate verification of signal changes resulting from a change in the measurand. 2.3 Appropriate use of technical documentation on the apparatus. 2.4 Judicious use of one's sense of sight, hearing, smell and touch. 2.5 Observance of occupational health and safety rules.

CODE: 027F	
3 To take measurements.	3.1 Correct application of the steps in the measurement method. 3.2 Proper distinction between random and systematic errors. 3.3 Precise measurement of physical quantities in both static and dynamic mode. 3.4 Determination of the causes and values of systematic errors. 3.5 Correct determination of the magnitude of physical parasitic quantities. 3.6 Appropriate use of measuring instruments. 3.7 Appropriate use of a data acquisition and processing system. 3.8 Observance of occupational health and safety rules.
4 To determine the value and precision of the measurements.	4.1 Correct application of the data processing method. 4.2 Appropriate use of statistical and linearization methods. 4.3 Appropriate use of uncertainty calculation techniques. 4.4 Consideration of systematic errors. 4.5 Proper estimate of uncertainties caused by the apparatus and the application of the measurement method. 4.6 Exact calculation of the measurement's central value and its uncertainty. 4.7 Appropriate use of software. 4.8 Appropriate use of technical documentation. 4.9 Adherence to norms and writing standards. 4.10 Adherence to presentation rules for tables and graphs.
5 To validate the precision of the measuring method versus the requirements.	5.1 Comparison of results and levels of precision obtained in static and dynamic mode with the required level of precision. 5.2 Accuracy of findings. 5.3 Relevant advice concerning potential modifications to the measurement method. 5.4 Adherence to current writing standards and norms.

CODE: 027G	
OBJECTIVE	STANDARD
Statement of the Competency To assemble applied physics apparatus.	**Achievement Context** • Using diagrams, circuits and components. • Using : – measuring and tracing instruments; – power tools such as wire cutters, milling machine, tower and column drill; – hand tools; – soldering and splicing units for optical fibres; – technical documentation.
Elements of the Competency	**Performance Criteria**
1 To understand diagrams of the apparatus.	1.1 Identification of the function of components as well as parts of the apparatus. 1.2 Statement of important parameters. 1.3 Statement of assembly and manufacturing tolerances. 1.4 Statement of the steps in the assembly and manufacturing processes.
2 To produce necessary parts.	2.1 Appropriate selection of material. 2.2 Appropriate choice of machining technique. 2.3 Appropriate use of measuring and tracing instruments. 2.4 Appropriate use of power and hand tools. 2.5 Appropriate use of tapping and threading techniques. 2.6 Adherence to tolerances. 2.7 Cleanliness of the workspace. 2.8 Observance of occupational health and safety rules.

CODE: 027G	
3 To build circuits and components.	3.1 Correct positioning of circuits and components. 3.2 Selection of appropriate fasteners. 3.3 Correct and solid component attachment. 3.4 Appropriate use of soldering, unsoldering and gluing techniques. 3.5 Appropriate use of hand tools. 3.6 Adherence to tolerances. 3.7 Cleanliness of the workspace. 3.8 Observance of occupational health and safety rules.
4 To wire circuits as well as electrical, electronic or optical components.	4.1 Appropriate use of wiring, soldering and splicing techniques. 4.2 Correctly built connectors. 4.3 Appropriate use of measuring instruments. 4.4 Proper conductivity and insulation. 4.5 Adherence to tolerances. 4.6 Cleanliness of the workspace. 4.7 Observance of occupational health and safety rules.

CODE: 027H	
OBJECTIVE	STANDARD
Statement of the Competency To use design and simulation software.	**Achievement Context** • Based on sketches of the components, apparatus, set-ups, installations and physical system models. • Using drawing, simulation and design software.
Elements of the Competency	**Performance Criteria**
1 To design plans for components, apparatus, set-ups and installations.	1.1 Proper interpretation of the sketches. 1.2 Correct representation of the elements. 1.3 Complete proposal that is adapted to the specific requirement. 1.4 Correct writing and placement of design notes. 1.5 Plans corresponding to the sketches. 1.6 Appropriate use of software. 1.7 Adherence to readability standards. 1.8 Adherence to standards and conventions.
2 To simulate physical systems.	2.1 Proper understanding of the sketches. 2.2 Proper understanding of the characteristics of the physical model. 2.3 Appropriate choice of dependent and independent variables. 2.4 Correct symbolic representation of the elements of the model and the relationships between them. 2.5 Exact entry of independent variable values and those associated with initial conditions. 2.6 Appropriate use of software. 2.7 Proper interpretation of results.

CODE: 027J	
OBJECTIVE	STANDARD
Statement of the Competency To set up a measuring chain.	**Achievement Context** • Based on design specifications. • Using : – data acquisition and processing system; – measuring instruments; – hand tools; – software; – technical documentation.
Elements of the Competency	**Performance Criteria**
1 To analyze design specifications.	1.1 Proper understanding of specifications. 1.2 Proper understanding of static and dynamic performance. 1.3 Proper analysis of physical quantity transformations.
2 To select measuring chain components.	2.1 Appropriate use of technical documentation. 2.2 Consultation with appropriate resource personnel. 2.3 Proper analysis of the technical specifications of sensors as well as processing, transmission and power supply modules. 2.4 Appropriate choice of sensors, processing and transmission modules and power sources. 2.5 Correct determination of the circuits to adapt. 2.6 Exact calculation of transfer functions. 2.7 Appropriate use of software.

CODE: 027J	
3 To adapt signal processing and signal transmission circuits.	3.1 Appropriate use of technical documentation. 3.2 Proper understanding of electric and electronic diagrams. 3.3 Correct determination of technical specifications of electric and electronic components. 3.4 Appropriate choice of electric and electronic components. 3.5 Appropriate use of an assembly technique. 3.6 Appropriate use of hand tools. 3.7 Appropriate use of measuring instruments. 3.8 Proper circuit operation. 3.9 Adherence to design specifications. 3.10 Observance of occupational health and safety rules.
4 To set up the components of the measuring chain.	4.1 Proper understanding of installation diagrams. 4.2 Appropriate choice of fasteners. 4.3 Proper and solid component attachment. 4.4 Appropriate use of hand tools. 4.5 Correct installation of sensors, processing modules, transmission modules and power supplies. 4.6 Appropriate use of technical documentation. 4.7 Adherence to design specifications.
5 To connect the components of the measuring chain.	5.1 Proper understanding of wiring diagrams. 5.2 Correctly built connectors. 5.3 Appropriate use of wiring, soldering and splicing techniques. 5.4 Appropriate use of measuring instruments. 5.5 Proper conductivity and insulation. 5.6 Adherence to design specifications. 5.7 Observance of occupational health and safety rules.

CODE: 027J	
6 To calibrate the measuring chain.	6.1 Proper adjustment of measuring chain components. 6.2 Appropriate verification of the static and dynamic response of the measuring chain. 6.3 Rigorous application of a calibration method. 6.4 Appropriate use of measuring instruments. 6.5 Appropriate use of a data acquisition and analysis system. 6.6 Adherence to design specifications.

CODE: 027K	
OBJECTIVE	STANDARD
Statement of the Competency To establish the relationships between atomic models and material properties.	**Achievement Context** • Using : – descriptive models; – reference documents and the periodic table of elements.
Elements of the Competency	**Performance Criteria**
1 To analyze physical and energy quantification models.	1.1 Exact calculation of quantities of matter. 1.2 Exact calculation of charge quantities and electric currents. 1.3 Correct determination of electric and magnetic field effects on charged particles. 1.4 Proper analysis of the photoelectric effect.
2 To analyze models of isolated atoms.	2.1 Appropriate use of hydrogen atom models. 2.2 Proper description of electronic configurations. 2.3 Proper understanding of the periodic table of elements. 2.4 Proper analysis of the relationships between atomic spectra and electromagnetic wave emission and absorption phenomena.
3 To analyze models of bonded atoms.	3.1 Appropriate use of the electronegativity concept. 3.2 Proper description of the nature and properties of strong and weak atomic bonds. 3.3 Appropriate use of the concept of crystal structures. 3.4 Proper description of crystal structures and defects.

CODE: 027K	
4 To identify mechanical, thermal, electrical or optical properties.	4.1 Proper understanding of reference materials. 4.2 Proper analysis of the effect of atomic bonds on the mechanical and thermal properties of the material. 4.3 Proper analysis of the effect of the energy band structure on the electrical and optical properties of the material. 4.4 Proper analysis of the role of crystal defects on the mechanical, electrical and optical properties of the material. 4.5 Proper analysis of the role of electrical and optical polarization properties of the material. 4.6 Appropriate application of the rules of formal logic. 4.7 Correct conclusion.

CODE: 027L	
OBJECTIVE	STANDARD
Statement of the Competency To characterize materials.	**Achievement Context** • Characterizing using tests and measuring methods. • Using material samples. • Using : – testing standards or characterization procedures; – data acquisition and processing systems; – specialized measuring instruments; – specialized software.
Elements of the Competency	**Performance Criteria**
1 To analyze the request.	1.1 Recognition of the sample's physical characteristics and how the material is used. 1.2 Statement of physical quantities to measure and required precision levels. 1.3 Proper understanding of testing standards or measuring methods. 1.4 Appropriate choice of tests to perform or measuring methods. 1.5 Correct planning of the steps in test or measuring procedures.
2 To prepare for tests or measurements.	2.1 Appropriate choice of instruments for the measuring system. 2.2 Installation, verification and adjustment of measurement system apparatus. 2.3 Careful manipulation. 2.4 Judicious and correct application of sample preparation methods. 2.5 Correct installation of the sample.

CODE: 027L	
3 To perform tests or take measurements.	3.1 Correct application of testing standards or steps in the measurement method. 3.2 Precise measurement of physical quantities. 3.3 Correct sample recovery. 3.4 Clear, exact and complete notes on the data and their precision. 3.5 Appropriate use of measuring instruments. 3.6 Judicious use of a data acquisition system. 3.7 Observance of occupational health and safety rules.
4 To characterize the material.	4.1 Correct application of the data processing method. 4.2 Exact calculation of the value and precision of physical properties. 4.3 Proper determination of the material's mechanical, electrical, optical or thermal properties. 4.4 Appropriate use of software. 4.5 Evaluation of the reasonableness of results obtained.
5. To communicate the results of the characterization.	5.1 Proper description of the material's physical properties. 5.2 Use of appropriate vocabulary. 5.3 Correct writing of the characterization report. 5.4 Detailed and objective presentation of results.

CODE: 027M	
OBJECTIVE	STANDARD
Statement of the Competency To analyze thermal systems.	**Achievement Context** • Using : – thermometers, calorimeters, flowmeters, instruments to measure pressure and volume; – specialized software; – technical documentation.
Elements of the Competency	**Performance Criteria**
1 To diagram the system.	1.1 Proper description of system elements and the surrounding environment. 1.2 Proper description of mechanical, electric, chemical or electromagnetic energy contributions. 1.3 Proper analysis of physical mechanisms of thermal exchange. 1.4 Proper analysis of energy conversion mechanisms. 1.5 Clear diagram.
2 To measure thermodynamic values.	2.1 Appropriate choice of thermodynamic values to measure. 2.2 Consideration of thermodynamic equilibrium. 2.3 Appropriate choice and use of thermometers and instruments to measure pressure and volume. 2.4 Appropriate choice and use of temperature fixed points. 2.5 Precise measurement of temperatures, pressures or volumes. 2.6 Correct data processing. 2.7 Exact calculation of the value and precision of physical quantities. 2.8 Appropriate use of software. 2.9 Evaluation of the reasonableness of results obtained.

CODE: 027M	
3 To identify temperature effects.	3.1 Appropriate use of Ohm's Law, as well as calorimetric and thermal emission equations. 3.2 Appropriate application of state equations for a gas and the gas kinetic theory. 3.3 Correct determination of thermal equilibrium conditions. 3.4 Correct determination of heat quantities and the conditions producing thermal energy transfers. 3.5 Exact calculation of capacitance values, time constants, resistances and thermal exchange coefficients. 3.6 Exact calculation of thermal expansion and thermoradiation values. 3.7 Appropriate use of software. 3.8 Evaluation of the reasonableness of results obtained. 3.9 Detailed and objective presentation of results.

CODE: 027N	
OBJECTIVE	STANDARD
Statement of the Competency To characterize a wave, a component or an apparatus using wave optics set-ups.	**Achievement Context** • For characterizations using an optical test bench or board. • Using – characterization procedures; – wave optics equipment, lasers and incoherent light sources; – apparatus or instruments such as verniers, goniometers, collimators, viewers and photometers; – manual or automated positioning and micro-positioning systems; – data acquisition and processing system; – technical documentation; – specialized software.
Elements of the Competency	**Performance Criteria**
1 To study the request for characterization.	1.1 Statement of physical quantities to measure and required precision levels. 1.2 Proper understanding of use, technical specifications and component or apparatus operation. 1.3 Proper understanding of steps and equations involved in the characterization procedure. 1.4 Appropriate use of technical documentation.

CODE: 027N	
2 To assemble the elements of the characterization set-up.	2.1 Proper understanding of laser operation and elements in the set-up. 2.2 Correct determination of technical specifications of the elements in the set-up. 2.3 Appropriate choice of elements in the set-up. 2.4 Appropriate verification of elements in the set-up. 2.5 Precise positioning of elements in the set-up. 2.6 Appropriate use of alignment and attachment techniques. 2.7 Correct adjustment of lasers, incoherent light sources and alignment and measuring instruments. 2.8 Appropriate use of methods for carrying out a summary verification of the optical characteristics of elements in the set-up. 2.9 Careful manipulation. 2.10 Judicious use of software. 2.11 Observance of occupational health and safety rules.
3 To take measurements.	3.1 Correct component or apparatus installation. 3.2 Correct application of steps in the measurement method. 3.3 Appropriate use of techniques to modify polarization, spectral content and optical wave intensity. 3.4 Correct visual identification of points or zones of the optical beam having particular optical properties. 3.5 Precise measurement of positions, angles or illumination. 3.6 Adequate control of stray light. 3.7 Appropriate use of measuring instruments. 3.8 Appropriate use of manual or automated positioning and micro-positioning systems. 3.9 Judicious use of a data acquisition and processing system. 3.10 Observance of occupational health and safety rules.

CODE: 027N	
4 To characterize the wave, component or apparatus.	4.1 Proper understanding of relationships between the observed optical phenomena, measured optical properties and polarization, interference and diffraction phenomena. 4.2 Proper understanding of relationships between measured properties and the laws of radiometry and photometry. 4.3 Correct processing of position, angle or illumination measurements. 4.4 Exact calculation of the value and precision of physical quantities. 4.5 Appropriate use of software. 4.6 Evaluation of the reasonableness of the results obtained.
5 To communicate the results of the characterization.	5.1 Proper description of observed optical phenomena. 5.2 Proper description of optical properties of the wave, component or apparatus. 5.3 Use of appropriate vocabulary. 5.4 Correct writing of the characterization report. 5.5 Detailed and objective presentation of results.

CODE: 027P	
OBJECTIVE	STANDARD
Statement of the Competency To characterize waves, components or apparatus using guided optics set-ups.	**Achievement Context** • Using : – characterization procedures; – guided optics equipment, lasers and incoherent light sources; – multimode and monomode optical fibres and wiring equipment; – measuring instruments such as spectral analyzers, polarimeters and wattmeters; – manual or automated positioning and micro-positioning systems; – data acquisition and processing system; – technical documentation; – specialized software.
Elements of the Competency 1 To study the request for characterization.	**Performance Criteria** 1.1 Statement of physical quantities to measure and required precision levels. 1.2 Proper understanding of use, technical specifications and component or apparatus operation. 1.3 Proper understanding of steps and equations involved in the characterization procedure. 1.4 Appropriate use of technical documentation.

CODE: 027P	
2 To assemble the elements of the characterization set-up.	2.1 Proper understanding of laser operation and elements in the set-up. 2.2 Correct determination of technical specifications of elements in the set-up. 2.3 Appropriate choice of elements in the set-up. 2.4 Appropriate verification of elements in the set-up. 2.5 Precise positioning of elements in the set-up. 2.6 Appropriate use of alignment and attachment techniques. 2.7 Correct adjustment of optical sources as well as measuring and alignment instruments. 2.8 Appropriate use of guided optics wiring techniques. 2.9 Appropriate use of methods for carrying out a summary verification of the optical characteristics of elements in the set-up. 2.10 Exact measure of insertion losses. 2.11 Careful manipulation. 2.12 Judicious use of software. 2.13 Observance of occupational health and safety rules.
3 To take measurements.	3.1 Correct component or apparatus installation. 3.2 Correct application of steps in the measurement method. 3.3 Appropriate use of techniques to modify polarization, spectral content and optical power. 3.4 Precise measurement of polarization, spectral content and optical power. 3.5 Adequate control of stray light. 3.6 Appropriate use of measuring instruments. 3.7 Appropriate use of manual or automated positioning and micro-positioning systems. 3.8 Judicious use of a data acquisition and processing system. 3.9 Observance of occupational health and safety rules.

CODE: 027P	
4 To characterize the wave, component or apparatus.	4.1 Proper understanding of relationships between observed optical phenomena, measured optical properties and propagation, attenuation, polarization and interference phenomena. 4.2 Correct processing of polarization, spectral content and optical power measurements. 4.3 Exact calculation of the value and precision of physical quantities. 4.4 Appropriate use of software. 4.5 Evaluation of the reasonableness of the results obtained.
5 To communicate the results of the characterization.	5.1 Proper description of observed optical phenomena. 5.2 Proper description of optical properties of the wave, component or apparatus. 5.3 Use of appropriate vocabulary. 5.4 Correct writing of the characterization report. 5.5 Detailed and objective presentation of results.

CODE: 027Q	
OBJECTIVE	STANDARD
Statement of the Competency To program a data acquisition and processing system.	**Achievement Context** • Using : – data acquisition and processing system; – technical documentation.
Elements of the Competency	**Performance Criteria**
1 To define the characteristics of the program and plan the steps in its development.	1.1 Proper analysis of the problem and the context in which the program is to be used. 1.2 Proper analysis of the operation of the systems of the apparatus. 1.3 Proper analysis of the physical quantities. 1.4 Correct determination of the acquisition or processing functions to develop. 1.5 Correct determination of technical specifications of the inputs/outputs of the user interface and those of the equipment. 1.6 Correct determination of the symbolic representation of functions. 1.7 Appropriate use of technical documentation. 1.8 Definition of an appropriate development strategy.
2 To create the user interface.	2.1 Proper creation of interface objects. 2.2 Personalization of the user interface according to data acquisition and processing needs. 2.3 User-friendliness of the interface. 2.4 Appropriate use of the software. 2.5 Appropriate use of technical documentation.
3 To develop data acquisition and processing algorithms.	3.1 Correct determination of operations related to the functions. 3.2 Correct determination of the order in which operations are executed according to the functions. 3.3 Correct determination of the order of execution of acquisition and processing functions. 3.4 Correct representation of the algorithm. 3.5 Appropriate use of software. 3.6 Appropriate use of technical documentation.

CODE: 027Q	
4 To implement a data acquisition and processing algorithm.	4.1 Correct programming of calculations, conversions and control structures. 4.2 Correct programming of input/output instructions for the user interface and interface equipment. 4.3 Appropriate use of existing processing functions. 4.4 Appropriate use of programming language and software. 4.5 Appropriate use of technical documentation. 4.6 Conformity of the data acquisition and processing algorithm with the symbolic representation. 4.7 Creation of proper documentation for the algorithm. 4.8 Appropriate consultation with resource personnel.
5 To check program operation.	5.1 Appropriate verification of user interface and interface equipment operation. 5.2 Systematic testing of program functions. 5.3 Appropriate consultation with the users. 5.4 Proper debugging. 5.5 Appropriate use of software.
6 To update the program.	6.1 Proper analysis of update needs. 6.2 Correct modification of existing functions. 6.3 Judicious implementation of new functions. 6.4 Correct validation of modifications made. 6.5 Appropriate use of software. 6.6 Appropriate use of technical documentation. 6.7 Appropriate consultation with resource personnel.
7 To write the user's manual.	7.1 Pertinence and clarity of information. 7.2 Observance of spelling, grammar, syntax and punctuation rules. 7.3 Clarity of the representations.

CODE: 027R	
OBJECTIVE	STANDARD
Statement of the Competency To set up a positioning system.	**Achievement Context** • Based on design specifications. • Using : – data acquisition and processing system; – measuring instruments; – hand tools; – software; – technical documentation.
Elements of the Competency	**Performance Criteria**
1 To analyze design specifications.	1.1 Proper understanding of specifications. 1.2 Statement of displacements, velocities, accelerations, inertia and friction. 1.3 Proper understanding of static and dynamic performance. 1.4 Proper analysis of physical quantities.
2 To select the components of the positioning system.	2.1 Appropriate use of technical documentation. 2.2 Appropriate consultation with resource personnel. 2.3 Proper analysis of technical specifications of sensors, fractional power actuators, amplifiers, position controllers and mechanical translation and rotation systems. 2.4 Appropriate choice of mechanical translation and rotation systems. 2.5 Exact calculation of mechanical loads the actuator will encounter and electrical specifications required for the amplifier. 2.6 Appropriate choice of sensors, actuators, amplifiers and position controller. 2.7 Appropriate use of software.
3 To build the elements of the positioning system.	3.1 Proper understanding of installation diagrams. 3.2 Appropriate choice of fasteners. 3.3 Proper and solid component attachment. 3.4 Appropriate use of hand tools. 3.5 Correct installation of sensors, actuators, amplifiers and position controller. 3.6 Appropriate use of technical documentation. 3.7 Adherence to design specifications.

CODE: 027R	
4 To connect the elements of the positioning system.	4.1 Proper understanding of the wiring diagrams. 4.2 Correctly built connectors. 4.3 Appropriate use of wiring, soldering and splicing techniques. 4.4 Appropriate use of measuring instruments. 4.5 Proper conductivity and insulation. 4.6 Adherence to design specifications. 4.7 Observance of occupational health and safety rules.
5 To operate the system and make necessary adjustments.	5.1 Appropriate use of a data acquisition and processing system. 5.2 Exact calculation of transfer functions. 5.3 Correct execution of operational tests. 5.4 Correct adjustment of servo-control speed and position loops. 5.5 Appropriate verification of the positioning system's static and dynamic response. 5.6 Programming of the appropriate trajectory. 5.7 Appropriate use of software. 5.8 Adherence to design specifications.

CODE: 027S	
OBJECTIVE	STANDARD
Statement of the Competency To characterize a wave, a component or an apparatus using acoustic set-ups.	**Achievement Context** • For characterizations in free, reverberant or near-field contexts in the laboratory or on site. • Using : – characterization procedures; – acoustic materials and noise sources, ultrasound waves and vibrations; – apparatus and instruments such as microphones, sound-level meters, accelerometers, amplifiers and spectrum analyzers; – data acquisition and processing system; – noise and vibration control standards and regulations; – technical documentation; – specialized software.
Elements of the Competency 1 To study the request for characterization.	**Performance Criteria** 1.1 Statement of physical quantities to measure and required precision levels. 1.2 Proper understanding of use, technical specifications and component or apparatus operation. 1.3 Proper understanding of steps and equations involved in the characterization procedure. 1.4 Appropriate use of technical documentation.

CODE: 027S	
2 To assemble the elements of the characterization set-up.	2.1 Proper analysis of wave production mechanisms. 2.2 Proper understanding of noise and vibration control standards and regulations. 2.3 Proper understanding of the operation of the elements in the set-up. 2.4 Correct determination of technical specifications of the elements in the set-up. 2.5 Appropriate choice of elements in the set-up. 2.6 Appropriate verification of elements in the set-up. 2.7 Precise positioning of elements in the set-up. 2.8 Appropriate use of attachment techniques. 2.9 Correct adjustment of measuring instruments. 2.10 Pertinence of acoustic source adjustments. 2.11 Careful manipulation. 2.12 Judicious use of software. 2.13 Observance of occupational health and safety rules.
3 To take measurements.	3.1 Correct component or apparatus installation. 3.2 Correct application of steps in the measurement method. 3.3 Adequate control of parasitic acoustic sources. 3.4 Appropriate use of techniques to modify the wave's spectral content and intensity. 3.5 Precise measurement of acoustic pressures, accelerations, spectra or acoustic levels. 3.6 Appropriate use of measuring instruments. 3.7 Judicious use of a data acquisition and processing system. 3.8 Observance of occupational health and safety rules.

CODE: 027S	
4 To characterize the wave, component or apparatus.	4.1 Proper understanding of relationships between the observed acoustic phenomena or measured acoustic properties and acoustic wave propagation, reflection, attenuation, interference and diffraction phenomena. 4.2 Correct processing of acoustic pressure, acceleration, spectrum and acoustic level measurements. 4.3 Correct application of Fourier analysis. 4.4 Exact calculation of the value and precision of physical quantities. 4.5 Appropriate use of software. 4.6 Evaluation of the reasonableness of the results obtained.
5 To communicate the results of the characterization.	5.1 Proper description of observed acoustic phenomena. 5.2 Proper description of wave acoustic properties, the component or apparatus. 5.3 Proper description of acoustic wave effects. 5.4 Proper understanding of noise and vibration control standards and regulations. 5.5 Pertinence of recommendations concerning noise and vibration control. 5.6 Use of appropriate vocabulary. 5.7 Correct writing of the characterization report. 5.8 Detailed and objective presentation of results.

CODE: 027T	
OBJECTIVE	STANDARD
Statement of the Competency To develop an applied physics apparatus.	**Achievement Context** • Based on design specifications. • Using : – data acquisition and processing system; – measuring instruments; – power and hand tools; – software; – technical documentation.
Elements of the Competency	**Performance Criteria**
1 To analyze design specifications.	1.1 Proper understanding of the technical specifications of the apparatus. 1.2 Proper understanding of the design specifications. 1.3 Proper analysis of the respective functions of the systems that make up the apparatus. 1.4 Proper analysis of the physical principals on which the apparatus's operation is based. 1.5 Proper analysis of physical quantities. 1.6 Schedule and budget statement. 1.7 Correct planning of the development steps.
2 To set up a test bench.	2.1 Correct determination of the water, gas and electricity supply needs. 2.2 Choice of appropriate set-up. 2.3 Appropriate choice of elements in the set-up. 2.4 Correct assembly of elements in the set-up. 2.5 Appropriate use of measuring instruments. 2.6 Correct programming of the data acquisition and processing system. 2.7 Appropriate use of software. 2.8 Appropriate consultation with resource personnel. 2.9 Observance of occupational health and safety rules.

CODE: 027T	
3 To develop the physical system of the apparatus.	3.1 Correct determination of the water, gas and electricity supply needs. 3.2 Choice of appropriate components. 3.3 Selection of appropriate suppliers and sub-contractors. 3.4 Correct assembly and wiring of physical system components. 3.5 Correct installation of supply sources. 3.6 Correct adjustment and alignment of physical system components. 3.7 Judicious use of a technique to compensate for temperature effects. 3.8 Performance optimization of the physical system. 3.9 Appropriate consultation with resource personnel. 3.10 Appropriate use of measuring instruments. 3.11 Appropriate use of the data acquisition and processing system. 3.12 Adherence to design specifications. 3.13 Adherence to the budget. 3.14 Observance of occupational health and safety rules.
4 To design and build a measuring chain, positioning system and data acquisition and processing system.	4.1 Correct determination of technical specifications. 4.2 Choice of appropriate components. 4.3 Selection of appropriate suppliers and sub-contractors. 4.4 Careful creation of the measuring chain and positioning system. 4.5 Performance optimization. 4.6 Appropriate consultation with resource personnel. 4.7 Appropriate use of measuring instruments. 4.8 Correct programming of data acquisition and processing functions. 4.9 Adherence to design specifications. 4.10 Adherence to the budget. 4.11 Observance of occupational health and safety rules.

CODE: 027T	
5 To encase the system.	5.1 Correct determination of casing specifications. 5.2 Correct assembly of the apparatus. 5.3 Appropriate use of measuring instruments. 5.4 Adherence to design specifications. 5.5 Adherence to the budget. 5.6 Observance of occupational health and safety rules.
6 To operate the apparatus and make necessary adjustments.	6.1 Appropriate verification of the operation of the systems that make up the apparatus. 6.2 Judicious use of troubleshooting techniques. 6.3 Optimization of the operation of the apparatus. 6.4 Appropriate consultation with resource personnel. 6.5 Appropriate use of measuring instruments. 6.6 Appropriate use of the data acquisition and processing system. 6.7 Appropriate use of software. 6.8 Adherence to design specifications.
7 To characterize the apparatus.	7.1 Choice and appropriate adaptation of a measurement method. 7.2 Proper development of a characterization procedure. 7.3 Correct characterization of the apparatus. 7.4 Adherence to design specifications.
8 To write the necessary documentation.	8.1 Pertinence and clarity of information. 8.2 Observance of spelling, grammar, syntax and punctuation rules. 8.3 Clear plans and representations.

CODE: 027U	
OBJECTIVE	STANDARD
Statement of the Competency To develop an applied physics component.	**Achievement Context** • Based on design specifications. • Using : – data acquisition and processing system; – measuring instruments; – hand tools; – software; – technical documentation.
Elements of the Competency	**Performance Criteria**
1 To analyze design specifications.	1.1 Proper understanding of technical specifications of materials and the component. 1.2 Proper understanding of designs. 1.3 Proper analysis of the component's function. 1.4 Proper analysis of the physical principles on which the component operates. 1.5 Proper analysis of physical quantities. 1.6 Schedule and budget statement. 1.7 Correct planning of the steps in the development process.
2 To develop manufacturing systems, materials and components.	2.1 Proper understanding of physical principles and technologies relating to the manufacturing system. 2.2 Correct determination of the water, gas and electricity supply needs. 2.3 Appropriate choice of manufacturing system elements. 2.4 Correct assembly of manufacturing system elements. 2.5 Appropriate use of measuring instruments. 2.6 Correct programming of the data acquisition and processing system. 2.7 Performance optimization of manufacturing systems. 2.8 Appropriate use of software. 2.9 Appropriate consultation with resource personnel. 2.10 Observance of occupational health and safety rules.

CODE: 027U	
3 To produce the material.	3.1 Correct application of manufacturing techniques. 3.2 Careful manipulation. 3.3 Optimal material properties. 3.4 Appropriate use of measuring instruments. 3.5 Judicious use of a data acquisition and processing system. 3.6 Judicious use of positioning and micro-positioning systems. 3.7 Adherence to design specifications. 3.8 Consideration for the capacities and limitations of the manufacturing system. 3.9 Adherence to the budget. 3.10 Observance of occupational health and safety rules.
4 To build the component.	4.1 Proper choice of protection, shielding and support elements. 4.2 Correct component assembly. 4.3 Careful manipulation. 4.4 Judicious use of a technique to compensate for temperature effects. 4.5 Judicious use of an aging technique. 4.6 Component performance optimization. 4.7 Appropriate use of measuring instruments. 4.8 Judicious use of a data acquisition and processing system. 4.9 Judicious use of positioning and micro-positioning systems. 4.10 Adherence to design specifications. 4.11 Adherence to the budget. 4.12 Observance of occupational health and safety rules.
5 To characterize the component.	5.1 Choice and appropriate adaptation of a measurement method. 5.2 Correct development of a characterization procedure. 5.3 Correct component characterization. 5.4 Adherence to design specifications.

CODE: 027U	
6 To write the necessary documentation.	6.1 Pertinence and clarity of information. 6.2 Observance of spelling, grammar, syntax and punctuation rules. 6.3 Clear plans and representations.

CODE: 027V	
OBJECTIVE	STANDARD
Statement of the Competency To participate in setting up and managing a laboratory or production site.	**Achievement Context** • Using : – environmental standards for lighting, dust, vibration, static electricity, safety and air quality; – regulations regarding dangerous products and controlled materials; – calibration standards; – measuring instruments; – software; – technical documentation.
Elements of the Competency	**Performance Criteria**
1 To give advice on the purchase and choice of equipment.	1.1 Proper analysis of the function of the laboratory or production installation. 1.2 Schedule and budget statement. 1.3 Correct determination of apparatus and equipment specifications. 1.4 Proper supplier selection. 1.5 Appropriate use of technical documentation. 1.6 Pertinence of advice.
2 To plan the laboratory or installation set-up.	2.1 Proper analysis of water, gas and electricity needs. 2.2 Proper analysis of environmental standards. 2.3 Correct determination of necessary services. 2.4 Appropriate choice of service providers. 2.5 Proper positioning of equipment and workstations. 2.6 Optimal use of space and services. 2.7 Clear plans. 2.8 Appropriate consultation with resource personnel. 2.9 Adherence to ergonomic regulations. 2.10 Adherence to the budget.

CODE: 027V	
3 To participate in setting up the laboratory or installation.	3.1 Proper understanding of manufacturers' manuals. 3.2 Appropriate verification of available services. 3.3 Appropriate verification of equipment. 3.4 Correct attachment and connection of equipment. 3.5 Appropriate use of hand tools and measuring instruments. 3.6 Adherence to the set-up plan. 3.7 Respect for the professionals' participation limits. 3.8 Observance of occupational health and safety rules.
4 To participate in starting up the laboratory or installation.	4.1 Proper understanding of manufacturers' manuals. 4.2 Correct adjustment of equipment. 4.3 Correct application of operational test methods. 4.4 Appropriate use of measuring instruments. 4.5 Adherence to standards. 4.6 Work restricted to tasks for which one is qualified. 4.7 Observance of occupational health and safety rules.
5 To maintain the apparatus and equipment.	5.1 Appropriate use of technical documentation. 5.2 Appropriate use of measuring instruments. 5.3 Appropriate use of troubleshooting techniques. 5.4 Correct application of calibration techniques. 5.5 Identification of environmental standard violations and instances where the service does not meet established requirements. 5.6 Adherence to maintenance standards and technical specifications. 5.7 Work restricted to tasks for which one is qualified. 5.8 Observance of occupational health and safety rules.

CODE: 027V	
6 To keep the inventory of products and parts up to date.	6.1 Appropriate storage of products and parts. 6.2 Proper stock management. 6.3 Proper management of equipment input and output. 6.4 Appropriate use of inventory management software. 6.5 Adherence to health and safety regulations as well as standards relating to dangerous products and controlled materials.
7 To write documentation on the management and use of the laboratory or installation.	7.1 Pertinence and clarity of information regarding services, equipment use and maintenance, the laboratory and installation. 7.2 Pertinence and clarity of information relative to the work request. 7.3 Observance of spelling, grammar, syntax and punctuation rules.

CODE: 027W	
OBJECTIVE	STANDARD
Statement of the Competency To participate in improving a manufacturing process in an applied physics context.	**Achievement Context** • Using : – quality and production standards; – measuring instruments; – software; – technical documentation.
Elements of the Competency	**Performance Criteria**
1 To study the request and analyze the process.	1.1 Proper understanding of the objectives of the request. 1.2 Proper understanding of the equipment's technical specifications. 1.3 Proper analysis of manufacturing methods and significant variables.
2 To participate in defining the tests.	2.1 Correct determination of operational variables to be evaluated, the manufacturing step to be verified, the equipment's technical characteristics to be tested or the inputs to be used. 2.2 Correct determination of testing conditions. 2.3 Appropriate use of simulation software. 2.4 Appropriate use of technical documentation. 2.5 Appropriate application of a problem-solving technique. 2.6 Appropriate consultation with resource personnel. 2.7 Proper writing and correction of the testing method.

CODE: 027W	
3 To prepare the tests.	3.1 Correct planning of activities. 3.2 Correct estimate of test duration and cost. 3.3 Appropriate choice, installation and adjustment of necessary equipment. 3.4 Appropriate verification of inputs. 3.5 Correct determination of points and sampling or measurement frequency. 3.6 Appropriate choice, installation and adjustment of measuring instruments and the data acquisition and processing system. 3.7 Appropriate use of technical documentation. 3.8 Appropriate consultation with resource personnel. 3.9 Observance of occupational health and safety rules.
4 To perform the tests.	4.1 Correct application of the steps in the test method. 4.2 Correct application of stop and start-up protocols. 4.3 Correct application of the sampling protocol. 4.4 Clear, exact and complete record of data. 4.5 Observance of occupational health and safety rules.
5 To determine optimal operating conditions.	5.1 Appropriate consultation with resource personnel. 5.2 Correct determination of the optimal value of the operational variable, pertinence of the manufacturing step, the apparatus providing optimal performance or the input resulting in optimal results. 5.3 Proper understanding of quality standards. 5.4 Relevant and accurate graphics. 5.5 Correct application of calculation methods and static data processing. 5.6 Relevant recommendations. 5.7 Appropriate use of software. 5.8 Evaluation of the plausibility of the results obtained.

CODE: 027W	
6 To provide technical support.	6.1 Relevant information concerning the procedure, personnel training, manufacturing and maintenance methods and safety measures. 6.2 Clear statements. 6.3 Use of appropriate vocabulary. 6.4 Respect for the rights and needs of others.

CODE: 027X	
OBJECTIVE	STANDARD
Statement of the Competency To participate in designing an apparatus or component used in applied physics.	**Achievement Context** • Based on a design project. • Using : – a manufacturing system or an existing test bench; – software.
Elements of the Competency	**Performance Criteria**
1 To analyze the component or apparatus development project.	1.1 Identification of the function of the component or apparatus. 1.2 Proper understanding of the physical principles. 1.3 Proper analysis of characteristics of the component or apparatus to develop. 1.4 Correct determination of information needed or resource personnel to consult.
2 To research scientific information.	2.1 Appropriate use of research tools. 2.2 Appropriate consultation with resource personnel. 2.3 Statement of knowledge, methods, standards and products involved in developing the project. 2.4 Clear and complete presentation of research results.
3 To participate in defining solutions.	3.1 Proper analysis of collected information. 3.2 Appropriate use of a problem-solving technique. 3.3 Proper understanding of physical principles. 3.4 Pertinence of advice. 3.5 Clear diagrams. 3.6 Demonstration of open-mindedness and good listening skills. 3.7 Respect for confidentiality.

CODE: 027X	
4 To test solutions.	4.1 Appropriate use of simulation software, manufacturing system or test bench. 4.2 Close observation of physical phenomena. 4.3 Careful manipulation. 4.4 Clear, exact and complete notes on the data and their precision. 4.5 Observance of occupational health and safety rules.
5 To participate in selecting a solution.	5.1 Proper analysis of tested solutions. 5.2 Proper analysis of observed physical phenomena. 5.3 Appropriate use of a problem-solving technique. 5.4 Pertinence of advice. 5.5 Demonstration of open-mindedness and good listening skills. 5.6 Respect for confidentiality.
6 To participate in creating production specifications.	6.1 Proper description of physical principles involved. 6.2 Proper description of the various parts of the component or apparatus. 6.3 Correct development of technical specifications of the component or apparatus. 6.4 Clear plans and diagram. 6.5 Correct establishment of a schedule. 6.6 Correct cost estimate. 6.7 Observance of spelling, grammar, syntax and punctuation rules.

EDUCATIONAL INTENTIONS OF GENERAL EDUCATION

GENERAL EDUCATION COMMON TO ALL PROGRAMS AND GENERAL EDUCATION ADAPTED TO PROGRAMS

English, Language of Instruction and Literature

General Education Common to All Programs

The three sets of objectives and standards in English, Language of Instruction and Literature, pursue two general goals: mastery of the language of instruction and exploration of the riches of the literary heritage. Achievement of these goals is intended to bring the students to a college level of proficiency in the areas of reading, writing, listening and speaking. Building on the skills developed by students on completion of secondary school, the English program places a marked emphasis on written production and reading comprehension while at the same time consolidating listening and speaking skills.

The mastery of language skills will be achieved through regular and ongoing observance of the rules of correct writing and speaking and the production of texts supported by reading and the study of literature. Students will also be encouraged to develop an appreciation of literature by becoming acquainted with a number of significant literary works representative of various genres and periods and expressing a variety of literary themes. Both the aesthetic and cultural value of these texts and their formal aspects will be the objects of study.

All students entering college will begin their English studies with an introductory set of objectives and standards. This set has two possible formats. While both provide a range of reading, writing and literary activities, one includes additional reinforcement of reading and writing skills.

General Education Adapted to Programs

The set of objectives and standards for English, Language of Instruction and Literature, is placed in the context of general education and is a complement to the general education common to all programs. Students will develop the skills required in order to communicate in the forms of discourse appropriate to their field of study.

Outcome Objectives

Students who have achieved the general education objectives in English, Language of Instruction and Literature, will be able to :

- Demonstrate a college level of proficiency in the areas of reading, writing, listening and speaking.
- Develop their own ideas into arguments and theses, organize them and edit their work.
- Understand basic vocabulary and terminology used when discussing literature.
- Analyze literary works.

Humanities

Humanities, as part of the core curriculum, is intended to promote personal and social development and to give students a foundation that will help them understand their roles in contemporary society as members of the labour force, citizens, and individuals. The three sets of objectives and standards in Humanities propose common frameworks for understanding the experiences, ideas and values of humankind and their diversity. They are aimed at developing critical thinking, reinforcing the ancillary skills involved in careful reading, organized writing, and well-developed oral presentations, and, where appropriate, improving media and computer literacy. Once students have mastered the three-stage process of analysis, synthesis and evaluation, they will be able to reflect in an informed manner and to communicate what they have learned in an organized and coherent fashion.

Principles

1) Humanities constitutes a thematic, multidisciplinary, at times transdisciplinary, exploration of humankind, including its accomplishments, failures, abilities, creations, ideas, and values.
2) Humanities helps students to recognize, define and classify information and provides them with common frameworks for diverse methods of analyzing, synthesizing and evaluating conceptions of society, knowledge and values.
3) Humanities aims to prepare students for common civic responsibilities and the exercise of rights.
4) Humanities pursues the general goal of developing critical thought, valuing it, and recognizing its limitations.

Outcome Objectives

Students who have achieved the general education objectives in Humanities will be able to :

- Describe, explain and organize 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.
- 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.

Sequence of Objectives and Standards

The first two sets of objectives and standards in Humanities, which are part of the general education component common to all programs, develop similar skills in a recursive fashion.

In the first set the emphasis is on how knowledge is defined, acquired, classified, transmitted, and applied. Students examine both messages and media to identify the strengths and limitations of each. Students learn to situate knowledge in a social, historical and personal context, a skill they will need in order to become lifelong learners.

The second set focuses on how individuals, groups, societies or nations organize ideas, perceptions and values into explanatory patterns. Students explore major ideas and value systems by which diverse individuals, groups, societies or nations seek to explain the world and their place in it.

The third set, which is part of the general education component adapted to programs, is aimed at deepening and reinforcing the critical thinking skills developed in the first two sets. It is, therefore, sequenced so that students can build on the critical skills, knowledge and insights developed in the first two sets. By situating these issues in their appropriate world-view and knowledge contexts, students develop a critical and autonomous approach to ethical values in general and to the values involved in their own fields of interest in particular. This final set also provides students with an opportunity to consolidate personal and social values.

Français, langue seconde

L'enseignement du français, langue seconde, contribue à la formation fondamentale de la personne, en même temps qu'il a pour objet de lui permettre de communiquer efficacement avec ses concitoyens et concitoyennes.

Principes

1) La maîtrise du français, langue seconde, est essentielle pour quiconque veut participer pleinement à la vie de la société québécoise, dont le français est la langue officielle. En conséquence, la formation générale en français, langue seconde, a pour finalité de rendre les étudiants et les étudiantes aptes à utiliser de façon efficace les moyens dont dispose la langue pour communiquer en société. À cette fin, ils devront acquérir des connaissances en vue de les déployer dans les formes de discours qu'il leur faudra pratiquer.

    1) À leur arrivée au collégial, les étudiants et les étudiantes ont déjà acquis des compétences dans les quatre habiletés langagières, à savoir : parler, lire, écouter et écrire, mais sont, de façon générale, plus compétents en matière d'expression orale. En conséquence, la formation porte sur le développement des quatre habiletés langagières tout en mettant l'accent sur la lecture et l'écriture.
    2) En tant que partie intégrante de la formation générale, le français, langue seconde, contribue au développement de la pensée critique et de l'expression structurée.

Résultats attendus

Tout étudiant ou toute étudiante qui a atteint les objectifs de formation générale en français, langue seconde, pourra, selon son niveau de compétence, montrer :

- sur le plan des connaissances, qu'il ou elle :

  - sait faire une présentation orale structurée;
  - connaît les différentes formes du discours;
  - connaît les différentes techniques de lecture et d'écriture;

- sur le plan des habiletés, qu'il ou elle :

  - est capable de questionner, d'analyser, de juger, et d'argumenter en français;
  - est apte à entretenir des rapports sociaux et à partager la vie culturelle du Québec;
  - est apte à établir, à poursuivre et à pratiquer des rapports professionnels en français;

- sur le plan des attitudes, qu'il ou elle :

  - fait preuve d'ouverture par rapport aux différents aspects de la culture québécoise;
  - a conscience des différences et des similitudes entre sa culture d'origine et la culture québécoise francophone;
  - a la préparation voulue pour s'insérer dans la vie sociale et économique.

Séquence des objectifs et des standards

Pour répondre aux divers besoins d'apprentissage des étudiants et des étudiantes du collégial, les ensembles en français, langue seconde, sont répartis selon quatre niveaux. Chacun de ces niveaux permet d'amener les étudiants et les étudiantes à interpréter et à produire des textes de plus ou moins grande complexité.

La formation générale en français, langue seconde, comporte deux ensembles prévus en séquence. Le premier, qui fait partie de la formation générale commune à tous les programmes, a pour objet de consolider les connaissances linguistiques déjà acquises et de les développer pour amener les étudiants et les étudiantes à communiquer de façon plus précise sur le plan tant du vocabulaire et de la syntaxe que de l'organisation textuelle.

Le second ensemble, qui fait partie de la formation générale propre aux programmes, s'appuie sur les acquis développés dans le premier ensemble en les enrichissant d'éléments de compétence liés aux champs d'études de l'étudiant ou de l'étudiante. On cherche à développer la précision de l'expression dans des situations de communication particulières qui relèvent du champ d'études de l'étudiant ou de l'étudiante.

Physical Education

Physical Education, as part of the core curriculum, is aimed at promoting the development of the whole person and at encouraging students to acquire responsible behaviours with respect to their health and quality of life.

Principles

1) Physical Education introduces students to different ways of being physically active with a view to making them aware that they are responsible for their health. Students learn concepts and acquire knowledge drawn from the literature and methodically apply them to physical activities apt to lead them to adopt behaviours characteristic of a healthy lifestyle.
2) Physical Education enables students to improve their proficiency in an activity and, in doing so, serves to increase their motivation and perseverance to remain physically active, and makes them aware of the contributing factors. To this end, students use a learning process designed to enhance their aptitudes for a given physical activity (i.e. their skills and attitudes).
3) Physical Education contributes to making students responsible for assuming responsibility for their health through the maintenance and improvement of their physical fitness and through the sensible practice of physical activity. Students learn to combine being physically active in an effective manner with factors which promote health.
4) Physical Education makes students aware of the importance of sharing the knowledge they have acquired. The pleasure and sense of well-being students get out of Physical Education classes motivate them to encourage others to be physically active and to adopt healthy behaviours.

Outcome Objectives

Students who have achieved the general education objectives in Physical Education will be able to demonstrate :

- their knowledge of :
  - The relationship between physical activity, lifestyle and health based on the findings of scientific research.
  - The scientific principles for improving or maintaining one's fitness.
  - Ways to assess their abilities and needs with respect to activities which can enhance their health.
  - The rules, techniques and conditions involved in different types of physical activity.
  - A method for setting goals.
  - The factors which facilitate making physical activity part of one's lifestyle.

- their ability to :
  - Choose physical activities on the basis of their motivation, abilities and needs.
  - Establish relationships between lifestyle and health.
  - Apply the rules, techniques and conditions involved in different types of physical activity.

- Set goals that are realistic, measurable, challenging, and situated within a specific time frame.
- Improve their mastery of the basic techniques, tactics and strategies associated with sports, outdoor and expression-oriented activities.
- Use their creative and communication skills, particularly in group activities.
- Evaluate their skills, their attitudes and their progress with respect to different forms of physical activity.
- Maintain or increase their physical activity level and fitness level on their own.
- Manage a personal physical activity program and assume responsibility in the organization of physical activities.

- their capacity to (i.e. their attitudes) :
  - Recognize the importance of taking charge of their health.
  - Be aware of the need to evaluate and respect their abilities and how the activity is to be carried out, before initiating the activity.
  - Foster self-confidence, self-control, respect for others and cooperation, through the knowledge they have acquired and through participation in physical activity.
  - Respect the environment in which the activities are held.
  - Appreciate the aesthetic and play value of physical activity.
  - Promote a balanced and active lifestyle as a social value.

Sequence of Objectives and Standards

The three sets of objectives and standards in Physical Education are designed in a learning sequence. The first two are prerequisites for the third.

The first set focuses on the relationship between good health and physical activity as related to a healthy lifestyle. Students are required to try one or more activities and to relate them to their abilities, needs, motivation, lifestyle and knowledge of health promotion. This enables them to make an appropriate and justified choice of physical activities.

The second set looks at the improvement of effectiveness through the use of a goal-oriented approach in a sport, outdoor or expression-oriented activity. After an initial assessment, students are called upon to evaluate their abilities and attitudes with respect to a physical activity, to set goals, and to interpret their progress.

The third set is aimed at bringing students to integrate physical activity into their lifestyle, more particularly through more effective management of factors which facilitate such an integration. During contact-hours with the teacher, students apply the knowledge they have acquired in the first two sets. This is done through the safe and effective practice of physical activity and through the development, realization and evaluation of a personal physical activity program, which students follow and validate under their teacher's supervision. The hours allotted for personal work enable students to complete their personal program.

COMPLEMENTARY GENERAL EDUCATION

Social Sciences

The two sets of objectives and standards aim to familiarize students with the social sciences and their particular approach to the human condition.

The first set supports learning activities that allow students to look at one or more of the social sciences in relation to major contemporary issues: subjects studied in the social sciences; contribution of the social sciences to an understanding of contemporary issues; issues facing the social sciences in the future.

The second set supports learning activities in the social sciences that allow students to rigorously analyze one of the major problems of our time, using one or more social scientific approaches.

Science and Technology

In science and technology, the educational intention is to present science and technology as a specific approach to reality, in order to familiarize students with this field of knowledge. This general intention can take several forms, such as helping students gain experience with the scientific method or study the evolution, challenges and consequences of scientific and technological discoveries.

The first set of objectives and standards emphasizes the general nature and scope of science and technology.

The second set emphasizes using the scientific method.

Modern Languages

The three sets of objectives and standards in modern languages introduce students to the basic language structures and vocabulary of a third language while making them aware of the culture of the people who speak the language.

Some modern languages use different structures and writing systems. The three sets have been developed in accordance with this fact. The degree of competency acquisition will therefore vary according to how distant the language is from the structure of our own language or system of thought. Furthermore, awareness of the culture of the people using a modern language does not figure as an element of competency, since learning a modern language implies acquiring an awareness of its culture.

Mathematics Literacy and Computer Science

In mathematics literacy and computer science, the two sets of objectives and standards are based on the educational intention of developing mathematical and computer culture.

The educational intention of the first set is to lead students to consider the place, role and evolution of these knowledges and tools in our society and to describe their different uses. It consists of general education about the language of mathematics or computers, and does not include specialized training.

The second set targets the understanding and use of the language of mathematics or computers for everyday purposes. This intention refers mainly to the concepts, tools and general uses of mathematical or computer language in daily life.

Since the objectives and standards for the field of mathematics literacy and computer science are of a general nature, they can be used to define various learning activities that foster development of competencies in mathematics or computer science, or in a combination of these two areas.

Art and Aesthetics

In art and aesthetics, the educational intention is to allow students to acquire general cultural knowledge by exploring various forms of art in one or more artistic fields. This basic education is intended to develop an artistic sensibility through exposure to works of art or experimentation in an artistic medium. Furthermore, it aims to teach the fundamental elements of the language of art and to enable students to make connections between those elements.

In the context of the first set of objectives and standards, students are introduced to works of art from contemporary culture and from other periods. This allows them to develop an appreciation for the dynamics of the imagination in art and to learn methods of analyzing artistic production.

In the context of the second set, students engage in creative or interpretive activities in a given artistic medium. As well, students are introduced to artistic works in that medium so that they may learn to recognize its primary forms of expression.

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