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MECHANICAL MANUFACTURING

MECHANICAL ENGINEERING TECHNOLOGY

Program of study
241.A0

VOCATIONAL and TECHNICAL EDUCATION

Québec

MECHANICAL MANUFACTURING

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

Mechanical Engineering Technology – 241.A0

The following modification pertains to the addition of a specific admission requirement:

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 IV Mathematics, Technical and Scientific option or Science option, or the Secondary V Cultural, Social and Technical option
- Secondary V Physics

Change approved in 2016

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

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 IV Mathematics, Technical and Scientific option or Science option
- Secondary V Physics

Change approved in 2009

The modification made involved a change to the number of elective competencies on the list established by the Minister:

Allow institutions to select 7 to 10 competencies from the list of elective competencies established by the Minister.

Change approved in 2000

Type of certification : Diploma of college studies

Number of credits : 91

Duration : 2 790 hours of instruction

General education component :	660	hours of instruction
Specific program component :	2 130	hours of instruction

Conditions for admission

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 IV Mathematics, Technical and Scientific option or Science option, or the Secondary V Cultural, Social and Technical option
- Secondary V Physics

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INTRODUCTION TO THE PROGRAM

The *Mechanical Engineering Technology* program is in keeping with the aims and orientations of technical education that guide the Direction générale de la formation professionnelle et technique. It has been designed in accordance with the framework for developing technical programs, which requires participation by partners from the business and educational communities.

This program is formulated in terms of competencies, objectives and standards. It was designed using an approach that takes into account training needs, the employment situation and the general goals of technical education, and it will provide the basis for the definition and evaluation of learning activities. It lends itself to the application of the program-based approach.

The *Mechanical Engineering Technology* program includes a general education component common to all programs (16 2/3 credits), a general education component specific to the program (6 credits), a general education component complementary to the other program components (4 credits) and a program-specific component (64 1/3 credits).

This program aims to train technicians who are versatile enough to meet the needs of industry. To this end, it includes a compulsory core program of 23 competencies. In addition, the program offers colleges a series of elective competencies designed to meet regional demands and allow a greater degree of specialization, particularly in design and manufacturing. Each educational institution must select seven of the ten elective competencies.

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 specific program component.

VOCABULARY USED

Program

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

Competency

For the specific program component of a technical program: an integrated set of cognitive and psychomotor skills and socio-affective 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

For the specific program component of a technical program, the statement of the competency is the result of an analysis of the work situation, the general goals of technical education and, in certain cases, other factors. It consists of an action verb and an object. It must be clear and unequivocal.

For the general education component, the statement of the competency is the result of an analysis of the needs of general education.

Elements of the competency

For the specific program 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 essential elements of the competency.

For the general education component, the elements of the objective, formulated in terms of a competency, specify the essential elements 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

For the specific program 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

For the specific program component of a technical program, the performance criteria define the requirements that make it possible to judge the attainment of each of the elements 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.

For the general education component, 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 attained.

Learning activities

For the specific program component of a technical program, the learning activities are classes (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.

For the general education component, 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 *Mechanical Engineering Technology* program trains students to design various mechanical components, plan the manufacturing of the components and control their quality.

Graduates of the program can work as technicians in manufacturing plants, engineering consulting firms, and in companies where mechanical manufacturing is a support activity for production. Designers and mechanical manufacturing technicians can also work in the fields of design and mechanical manufacturing. In some companies, such specialists are required to work in both fields. Graduates can also specialize in programming, quality control, research and development, as well as in maintenance.

Designers

The work performed by designers varies according to the size of the company, the type of work organization and, more importantly, the manufactured product. During the first few years, designers may only be required to produce technical drawings using computer-aided drafting (CAD) applications. Elsewhere, commensurate with their capabilities and potential, they may quickly become responsible for designing or even coordinating design projects. Their work could just as easily involve the designing of tools or industrial piping systems, as it could require them to design mechanical components and systems with their housings. Depending on the workplace structure, designers work independently or as members of a multidisciplinary team. They can also work in research and development.

Mechanical manufacturing technicians

Similar to those of design graduates, the tasks of mechanical manufacturing technicians depend on the type of company which employs them. At the outset, technicians may be given machining tasks to perform so they can master more fully the manufacturing processes used in the company. After a period of time gaining experience, they may take on varied responsibilities, such as developing process sheets, programming numerical control machines, automated manufacturing, producing the necessary tools, manufacturing prototypes, controlling the quality of products, machine planning and maintenance, as well as organizing production work and coordinating certain tasks. They can also work in research and development. Depending on the size of the company and its production management methods, the technicians can specialize in one or several of these areas.

The *Mechanical Engineering Technology* program brings together two training requirements, versatility and specialization.

Versatility is acquired by mastering general competencies that allow technicians to perform the necessary tasks independently and to adapt to different work situations created by the changing nature of the industry and technology. Thus, the general competencies of the *Mechanical Engineering Technology* program teach technicians to apply the principals, methods and techniques characteristic of the field or of the new work organizations.

The technical skills needed to enable graduates to enter the job market are acquired by mastering specialized job-related competencies. Three of these competencies ensure the integration of the program's main components by the time of its completion and prepare students for a comprehensive examination. The design component focuses on *Coordinating a design project*, while the manufacturing component

focuses on *Organizing the work for a medium production run* and *Coordinating a medium production run*.

In accordance with the general goals of technical education, the *Mechanical Engineering Technology* program is intended to:

- enable students to practise their profession with competence, by correctly performing the tasks and technical activities of the profession as soon as they enter the job market;
- help students adapt to professional life, by informing them about the job market in general, as well as the particular context of their profession;
- encourage students to develop and broaden their professional knowledge;
- foster the professional mobility of students by enabling them, among other things, to acquire the skills needed to manage their own careers.

The program also comprises the specific educational aims resulting from the analysis of the work situation and the *Étude préliminaire portant sur les compétences associées aux nouvelles organisations du travail.*1 The new workplace methods, the establishment of quality standards and the need to be competitive have led companies to introduce new requirements regarding the characteristics of the labour force. These new requirements, in addition to enhancing the employability of trained students, allow companies to maintain and ensure their strategic position in a constantly evolving marketplace. In this respect, the *Mechanical Engineering Technology* program fosters in the student the qualities sought after by employers. These are the ability to:

- understand and apply job-related instructions;
- develop interpersonal relationships and work in a team;
- adapt to change;
- ensure productivity (accuracy, conscientiousness, quality, speed);
- plan and organize their work and time in accordance with deadlines;
- demonstrate sound judgment;
- communicate in English, both orally and in writing;
- put forward new ideas and solutions;
- discuss and defend an idea or project;
- use the tools to increase productivity and ensure continued improvement;
- be an independent learner.

The *Mechanical Engineering Technology* program also trains students to develop their mechanical sense and their analytical and synthesizing skills, enhances their ability to process information and challenges them to keep up with the latest advances brought about by the rapid and constant changes in work methods and technology. Students will be required to work with technical documentation in both English and French.

1 Ministère de l'Éducation du Québec. *Étude préliminaire portant sur les compétences associées aux nouvelles organisations du travail dans le secteur manufacturier au Québec*, September 1996, p. 34.

THE 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 there is greater emphasis on the cultural aspect of academic subjects and leads students directly to the labour market or to university. The college system is responsive to current needs with respect to technical and pre-university education. It allows students to further their education without, however, 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.

Each college program features a general education component that is common to all programs, one that is adapted to the specific field of study, and one that is complementary. The goals of general education are to provide students with a common cultural core, to help them learn and develop generic skills, and to foster desirable attitudes. The desired outcomes are to educate students, to prepare them for their role as responsible members of society and to enable them to share in the common cultural heritage.

The common cultural core

Transmission of the common cultural core is aimed at allowing students to develop or acquire 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 other languages, primarily French or English;
- openness to the world and to cultural diversity;
- appreciation of the riches of their cultural heritage through familiarization with the accomplishments of human civilization;
- the ability to situate themselves with respect to the major schools of thought;
- the ability to think critically, independently and reflectively;
- personal and social ethics;
- mastery of knowledge relevant to 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 in analyzing situations;

- the ability to apply what they have learned in determining appropriate action;
- mastery of work methods;
- the ability to reflect on what they have learned.

Desirable attitudes

Cultural literacy and generic skills help students to acquire and develop the following attitudes:

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

These outcomes apply to the three general education components, more specifically:

- General education 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 adapted to programs, which introduces tasks or learning situations that are relevant to the field of study. 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, which allows students to complete their training with learning activities chosen with a view to achieving balance and complementarity in relation to 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 general and the specific education components are designed to contribute to students' education in an integrative fashion. In other words, the knowledge and skills transmitted in one component are reinforced and, whenever possible, reapplied in the other.

Each college-level institution must provide such general education through learning activities that are consistent with its educational project, within the framework of the stated outcomes, the given subject areas and ministerial guidelines.

All the sets of objectives and standards in the general education component are developed in keeping with the provisions of the *College Education Regulations* (R.S.Q., c. C-29, s. 18; 1993, c. 25, s. 11). Revised Edition, August 1998.

EDUCATIONAL INTENTIONS OF GENERAL EDUCATION

The educational intentions explain in detail the contribution of each field of studies included in the three components of general education (common to all programs, adapted to programs or complementary) to the achievement of the goals of general education. For the first two components, the educational intentions include a general statement of the role of each field of studies, the principles which underlie this role, the contribution of each field, in the form of outcome objectives, to the achievement of the goals of general education in terms of knowledge, abilities and attitudes, and an explanation of the sequence of objectives and standards.

The integral text of the educational intentions is at the end of this document.

LIST OF PROGRAM OBJECTIVES

GENERAL EDUCATION 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 ADAPTED TO PROGRAMS

(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

(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

(**64 1/3 credits**)

The following competencies are compulsory.

012D To analyze the occupation.
012E To solve problems related to industrial mechanics.
012F To interpret technical drawings.
012G To sketch objects.
012H To interpret technical information about materials and manufacturing processes.
012J To analyze the internal and external forces exerted on a mechanical object.
012K To plan the application of heat treatments.
012L To do the engineering design of an object's fasteners.
012M To use a computerized work station.
012N To produce detail drawings of mechanical components.
012P To take and interpret measurements.
012Q To operate a conventional lathe.
012R To operate a conventional milling machine.
012S To determine dimensional tolerances.
012T To determine the geometric tolerances required for an assembly.
012U To produce assembly drawings.
012V To operate a numerical control machine tool.
012W To program a machining centre manually.
012X To adapt to new types of work organization.
012Y To establish the sequence of operations for manufacturing processes.
012Z To control the quality of products.
0130 To modify the design concept of the components of a piece of industrial equipment.
0131 To do the engineering design of the tools necessary for a manufacturing project.

Elective competencies (each educational institution must select from 7 to 10 competencies)

0132 To keep abreast of new technologies.
0133 To program a numerical control lathe manually.
0134 To develop a process sheet.
0135 To do automatic programming.
0136 To produce the tools necessary to carry out a manufacturing project.
0137 To plan the maintenance of a machine population.
0138 To maintain manufacturing machines.
0139 To organize the work for a medium production run.
013A To coordinate a medium production run.
013B To produce flat pattern layouts.

013C To use the specialized functions of a computer-aided drafting (CAD) program.
013D To make a three-dimensional model of an object.
013E To develop hydraulic and pneumatic circuits for industrial machines.
013F To do the engineering design of an industrial piping system.
013G To do the engineering design of an industrial work process system.
013H To do the engineering design of machine housings.
013J To develop basic automated circuits.
013K To automate an industrial system.
013L To coordinate a design project.

HARMONIZATION

The Ministère de l'Éducation, du Loisir et du Sport 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 students' 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 *Mechanical Engineering 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 *Tableaux d'harmonisation, Techniques de génie mécanique.*

PART TWO

OBJECTIVES AND STANDARDS - GENERAL EDUCATION COMMON TO ALL PROGRAMS

GENERAL EDUCATION COMMON TO ALL PROGRAMS : LANGUAGE OF INSTRUCTION AND LITERATURE	CODE : 0004
OBJECTIVE	STANDARD
Statement of the competency To analyze and produce various forms of discourse.	
Elements	**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 COMMON TO ALL PROGRAMS : LANGUAGE OF INSTRUCTION AND LITERATURE	CODE : 0005
OBJECTIVE	STANDARD
Statement of the competency To apply a critical approach to literary genres.	
Elements	**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 COMMON TO ALL PROGRAMS : LANGUAGE OF INSTRUCTION AND LITERATURE	CODE : 0006
OBJECTIVE	STANDARD
Statement of the competency To apply a critical approach to a literary theme.	
Elements	**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 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	**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 COMMON TO ALL PROGRAMS : HUMANITIES CODE : 000G	
OBJECTIVE	STANDARD
Statement of the competency To apply a critical thought process to world views.	
Elements	**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 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	**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 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	**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 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	**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 ADAPTED TO PROGRAMS

GENERAL EDUCATION ADAPTED TO PROGRAMS : LANGUAGE OF INSTRUCTION AND LITERATURE	CODE : 000L
OBJECTIVE	STANDARD
Statement of the competency To communicate in the forms of discourse appropriate to one or more fields of study.	
Elements	**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 ADAPTED TO PROGRAMS : 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	**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
OBJECTIVE	STANDARD
Énoncé de la compétence Appliquer des notions fondamentales de la communication en français, liées à un champ d'études.	
Elements	**Performance criteria**
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
OBJECTIVE	STANDARD
Énoncé de la compétence Communiquer en français dans un champ d'études particulier.	
Elements	**Performance criteria**
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
OBJECTIVE	STANDARD
Énoncé de la compétence Communiquer avec aisance en français dans un champ d'études particulier.	
Elements	**Performance criteria**
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

COMPLEMENTARY GENERAL EDUCATION: 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	**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: 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	**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, spatio-temporal 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: 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	**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: 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	**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: 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	**Performance criteria**
1 Understand the meaning of a verbal message.	1.1 The acquisition of a modern language requires an awareness of the culture of the people who use the language. 1.2 Accurate identification of words and idiomatic expressions. 1.3 Clear recognition of the general meaning of simple messages. 1.4 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: 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	**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: 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	**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: 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	**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: 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	**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: 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	**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: ART AND AESTHETICS	CODE: 0014
OBJECTIVE	STANDARD
Statement of the competency To produce a work of art.	**Achievement context** • Students will work alone. • of the language and techniques specific to the medium selected.
Elements	**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 - SPECIFIC PROGRAM COMPONENT

CODE : 012D	
OBJECTIVE	STANDARD
Statement of the competency To analyze the occupation.	**Achievement context** • Using the latest information on the occupation, as well as on the companies in the field, the manufacturing process and the new types of work organization.
Elements	**Performance criteria**
1 To describe the different types of work organization in companies which employ mechanical engineering technicians.	1.1 Accurate differentiation among the various types of companies. 1.2 Relevant differentiation among companies with regard to management approaches and work organization.
2 To describe a manufacturing process and the various occupations involved.	2.1 Accurate representation of a process related to a type of manufacturing and the methods of manufacturing used. 2.2 Relevant association of types of work with main manufacturing activities.
3. To describe the nature and requirements of the job.	3.1 Relevance of the information gathered. 3.2 Detailed study of the general characteristics of the occupation and the work environment. 3.3 Awareness of job opportunities in companies that employ mechanical engineering technicians. 3.4 Accurate differentiation between the occupation and related occupations.
4. To examine job-related tasks and operations.	4.1 Appropriate study of operations, working conditions and performance criteria for each of the tasks involved. 4.2 Correct evaluation of the relative importance of the tasks. 4.3 Proper association of the steps involved in the work process with the tasks involved in the occupation.
5. To examine the skills, attitudes and behaviours required to practise the occupation.	5.1 Relevant association of skills and behaviours with the different tasks involved in the practice of the occupation.

CODE : 012D	
6. To recognize the opportunities available through further training and education and keeping up with technological development.	6.1 Accurate identification of the main factors stemming from the need for further training in the field of mechanical manufacturing. 6.2 Appropriate study of the opportunities available to workers in mechanical manufacturing. 6.3 Detailed list of documentation, reference sources and opportunities for further training and education.

CODE : 012E

HARMONIZATION

This competency is equivalent to Module 2 of ***Industrial Drafting*** (DVS) and Module 2 of ***Machining Techniques*** (DVS), as well as competency 011Q of ***Aircraft Manufacturing Technology*** (DEC).

OBJECTIF	STANDARD
Statement of the competency To solve problems related to industrial mechanics.	**Achievement context** • Using situations related to mechanical engineering. • Given: – tables, graphs and reference manuals; – relevant software, such as a spreadsheet, bearing in mind the evolution of the market. • Applying problem-solving strategies.
Elements	**Performance criteria**
1. To analyze situations involving variables.	1.1 Appropriate selection and use of units of measurement. 1.2 Detailed graphic representation of the problem to be solved. 1.3 Use of algebra to describe the links between the following variables: direct, inverse, affine, exponential. 1.4 Observance of rules related to round numbers. 1.5 Appropriate use of scientific notation in carrying out calculations. 1.6 Correct results obtained. 1.7 Correct interpretation of results according to the problem.
2. To identify dimensions and coordinates for complex objects.	2.1 Geometric illustration of the problem in graphic form. 2.2 Detailed analysis of the problem. 2.3 Proper identification of the trigonometric functions to be used. 2.4 Accurate conversion of problem into an algebraic equation. 2.5 Accurate calculation of angles and segments using trigonometric ratios. 2.6 Accurate calculation of coordinates.

CODE : 012E	
3. To prepare estimates using matrices.	3.1 Accurate matrix illustration of the problem. 3.2 Detailed analysis of the problem. 3.3 Appropriate choice of the required matrix operation. 3.4 Observance of the correct process for solving equations. 3.5 Accurate calculation of the results of the estimate. 3.6 Correct interpretation of results, according to the problems.
4. To analyze the forces exerted on an object.	4.1 Detailed drawing of the problem using a space diagram or a force diagram. 4.2 Detailed vector analysis. 4.3 Accurate identification of force components. 4.4 Appropriate choice of the vector operation to be carried out. 4.5 Accurate calculations. 4.6 Accurate identification of results of the forces involved. 4.7 Correct interpretation of results, according to the problem.
5. To analyze the variables of outputs, speeds and accelerations.	5.1 Detailed drawing of the problem. 5.2 Detailed analysis of the phenomenon involved. 5.3 Accurate determination of variables. 5.4 Set-up of links between variables using algebraic equations. 5.5 Appropriate determination of the type of differential equations illustrating the problem. 5.6 Correct solving of equations. 5.7 Description of the variable ratios through derivatives. 5.8 Correct interpretation of results, according to the problem.
6. To extend to different fields of application.	6.1 Relevance of links between different applications for each of the mathematical functions. 6.2 Detailed analysis of the problems, using the appropriate software.

CODE : 012F

HARMONIZATION

This competency is equivalent to Module 3 of ***Industrial Drafting*** (DVS) and Module 3 of ***Machining Techniques*** (DVS).

OBJECTIF	STANDARD
Statement of the competency To interpret technical drawings.	**Achievement context** • Given: - detail and assembly drawings in metric and imperial units of measurement; - drawings illustrating an assembly method or other illustrations; - instructions; - technical documentation; - tables; - drafting standards.
Elements 1 To visualize a complete part.	**Performance criteria** 1.1 Accurate differentiation among the types of projections: - American and European orthographic projections; - axonometric projections. 1.2 Proper identification of views and sections. 1.3 Accurate interpretation of lines and hatching lines. 1.4 Accurate identification of part on assembly drawing. 1.5 Accurate observations of the shape of the part and its position in the whole. 1.6 Proper drawing of symmetry of illustrated part. 1.7 Relevant association of lines, points and surfaces in different views.

CODE : 012F	
2 To interpret the dimensioning.	2.1 Thorough identification of information needed for the job: - dimensions; - dimensions with tolerances; - form, positioning and backlash tolerances; - nomenclature of threads; - fit tolerances. 2.2 Determination of value of: - dimensions; - dimensions with tolerances; - form tolerances; - positioning tolerances; - backlash tolerances; - size and location dimensions. 2.3 Relevant associations of the dimensions with the surfaces of various views.
3. To find complementary information in technical drawings.	3.1 Proper identification of information in: - title block; - list of terms used; - annotations. 3.2 Thorough identification of information needed. 3.3 Accurate interpretation of symbols, codes and abbreviations.
4 To determine the function of the components of an assembly.	4.1 Thorough identification of the components of an assembly in an assembly drawing. 4.2 Recognition of the characteristics of the components. 4.3 Recognition of the function of each component of the assembly and its relationship to the other components.

CODE : 012G

HARMONIZATION

This competency is equivalent to Module 4 of ***Industrial Drafting*** (DVS) and Module 8 of ***Machining Techniques*** (DVS). The content of competencies 012G, 012N, 012U of the present program corresponds to competency 011Q of ***Aircraft Manufacturing Technology*** (DEC).

OBJECTIF	STANDARD
Statement of the competency To sketch objects.	**Achievement context** • Given: - detail and assembly drawings in metric and imperial units of measurement; - American and European orthographic projections; - axonometric projections; - real parts to be sketched; - plotting and isometric paper; - measuring instruments; - different reference materials, such as tables, nomographs and technical manuals; - a scientific calculator. • Conformity with standards. • Sketching freehand or using basic instruments.
Elements 1 To sketch orthographic projections.	**Performance criteria** 1.1 Conformity with standards and conventions related to: - lines; - American projections; - European projections. 1.2 Accurate identification of dimensions of part to be sketched. 1.3 Determination of the number and layout of views. 1.4 Observance of proportions and shapes of the object to be sketched. 1.5 Proper application of sketching techniques. 1.6 Accurate, clean lines.

CODE : 012G	
2 To sketch axonometric projections.	2.1 Conformity with standards and conventions related to: - lines; - isometric drawings; - oblique projections. 2.2 Accurate identification of dimensions of the part to be sketched. 2.3 Observance of proportions. 2.4 Observance of shapes of the object to be sketched using skewed lines and ellipses. 2.5 Observance of sketching techniques. 2.6 Accurate, neat sketch.
3 To sketch sectional, auxiliary and partial views.	3.1 Conformity with standards and conventions related to: - lines; - hatching lines; - sections. 3.2 Appropriate choice of section. 3.3 Observance of proportions and shapes of the object to be sketched. 3.4 Observance of sketching techniques. 3.5 Accurate, neat sketch.
4 To dimension the sketch.	4.1 Conformity with standards and conventions related to: - extension lines; - dimension lines; - conventional and absolute dimensioning; - notation of dimensions in axonometric projections. 4.2 Proper arrangement of dimensions. 4.3 Dimensioning adapted to manufacturing. 4.4 Appropriate tolerance limits and surface finishes according to the role of the part or one of its components. 4.5 Proper use of symbols. 4.6 Proper use of metric and imperial systems of measurement. 4.7 Neat, clear dimensioning.

CODE : 012G	
5. To write the annotations and information in the title block.	5.1 Complete information. 5.2 Clarity and concision of notes. 5.3 Annotations adapted to manufacturing. 5.4 Proper use of the metric and imperial systems of measurement. 5.5 Neatness of annotations and information in the title block.

CODE : 012H

HARMONIZATION

This competency is equivalent to Module 9 of ***Industrial Drafting*** (DVS) and Module 7 of ***Machining Techniques*** (DVS).

OBJECTIF	STANDARD
Statement of the competency To interpret technical information about materials and manufacturing processes.	**Achievement context** • Using metallic, non-metallic and composite materials. • Given technical documentation in English and French: - technical drawings; - reference manuals relating to materials, such as *The Machinery's Handbook*; - catalogues of ferrous products; - data sheets, tables and standards, such as ANSI, SAE, ASTM and CSA.
Elements	**Performance criteria**
1. To describe the materials presented in the drawings.	1.1 Proper identification of the types of materials used in the part. 1.2 Accurate identification of the physical, mechanical and chemical properties presented in the technical documentation. 1.3 Accurate interpretation of Canadian, American and international material identification codes. 1.4 Accurate interpretation of specifications contained in tables. 1.5 Rough calculation of strength of material.
2. To determine the surface conditions and the tolerances of the part.	2.1 Accurate interpretation of symbols. 2.2 Appropriate association of surface conditions with the corresponding tolerances.
3. To describe the manufacturing processes presented in the documentation.	3.1 Appropriate determination of characteristic processes for: - moulding; - shaping; - machining; - welding; - assembling; - sintering. 3.2 Appropriate association of processing methods with their applications in different manufacturing sectors.

CODE : 012H	
4. To establish links between the object sketched and its manufacture.	4.1 Appropriate links with the processing methods and the machine tools to be used. 4.2 Appropriate association between the characteristics of the processing methods and the limitations of the materials. 4.3 Appropriate association between manufacturing processes and the required degree of precision and surface finishes. 4.4 Appropriate association between the specified surface treatments and heat treatments.

CODE : 012J

HARMONIZATION

The content of competencies 012J and 012K of the present program corresponds to competency 011W of ***Aircraft Manufacturing Technology*** (DEC).

OBJECTIF	STANDARD
Statement of the competency To analyze the internal and external forces exerted on a mechanical object.	**Achievement context** • Given: - set-ups applied to the design and planning of the manufacturing; - calculators, tables and nomographs; - technical documentation related to the sector of application. • Applying problem-solving strategies.
Elements	**Performance criteria**
1 To analyze the external forces exerted on a structure or a mechanical object.	1.1 Sketch of the problem. 1.2 Proper sketch of the physical phenomena. 1.3 Accurate result of single and coupled forces. 1.4 Accurate calculations of the equilibrium of translation and rotational forces. 1.5 Due consideration given to the principles of equilibrium. 1.6 Proper determination of distribution of forces in the parts of a structure. 1.7 Observance of problem-solving strategies.
2. To analyze the strength of materials.	2.1 Accurate distinction of the phenomena and the terms associated with each one. 2.2 Proper determination of the properties of the materials. 2.3 Accurate differentiation between the internal and external forces exerted. 2.4 Due consideration given to the principles related to strength. 2.5 Accurate calculation of distortions and different types of constraints. 2.6 Accurate determination of the limits of application of certain materials.

CODE : 012J	
3. To analyze kinematic motion in assemblies and systems.	3.1 Accurate determination of the types of motions involved. 3.2 Accurate determination of parameters, according to the type of motion. 3.3 Proper calculations for each type of motion.
4. To analyze forces exerted in a mechanism.	4.1 Detailed analysis of the causes and effects of motions (dynamics). 4.2 Accurate calculation of forces and their effects. 4.3 Due consideration given to dynamic principles. 4.4 Accurate determination of the forces needed to generate a given motion.
5. To analyze the energy generated in a mechanism.	5.1 Accurate determination of the relationship between the work and the energy generated. 5.2 Accurate calculation of work and energy. 5.3 Complete analysis of loss of energy. 5.4 Due consideration given to principles of energy conservation. 5.5 Accurate calculation of power and efficiency. 5.6 Accurate determination of a mechanism's performance.

CODE : 012K

HARMONIZATION

The content of competencies 012J and 012K of the present program corresponds to competency 011W of ***Aircraft Manufacturing Technology*** (DEC).

OBJECTIF	STANDARD
Statement of the competency To plan the application of heat treatments.	**Achievement context** • Given: - a part made of steel, cast iron, aluminum alloy or copper; - relevant technical documentation in English and French.
Elements	**Performance criteria**
1. To determine the properties needed for the part to be treated.	1.1 Accurate analysis of needs. 1.2 Detailed list of conditions imposed.
2. To choose the material for the part.	2.1 Detailed list of the parameters related to the use of the materials, using technical documentation provided. 2.2 Accurate calculations to establish the required characteristics. 2.3 Proper determination of the possibilities and limitations related to the treatment of a metal, based on its composition. 2.4 Proper choice of material.
3. To choose the type of heat treatment.	3.1 Accurate determination of the preliminary and complementary processes needed for the heat treatment, according to the material. 3.2 Proper choice of the type of heat treatment to be used, according to its characteristics and the need. 3.3 Feasibility of treatment, according to industrial and commercial criteria.
4. To determine quenching methods.	4.1 Due consideration given to quenching delays of the parts. 4.2 Accurate determination of quenching method, according to the treatment selected.

CODE : 012K	
5. To determine the design rules in order to avoid damage to the parts.	5.1 Accurate anticipation of possible deformations, according to the metal chosen. 5.2 Due consideration given to the possible deformations resulting from a heat treatment. 5.3 Strict observance of the rules related to the design of a part undergoing heat treatment.
6. To determine the steps involved in the heat treatment process.	6.1 Appropriate choice of method used in preparing and handling the parts. 6.2 Relevant indications related to the heat process. 6.3 Relevant indications related to maintaining the temperature. 6.4 Due consideration given to the proper quenching method.
7. To verify the validity of the choices through testing.	7.1 Proper choice of method to carry out testing. 7.2 Detailed check on the conformity of the mechanical characteristics of the material after the heat treatment. 7.3 Accurate determination of the causes of the defects. 7.4 Proper choice of corrections to be made. 7.5 Accurate entering of results in a report.
8. To place the treatment within the manufacturing process.	8.1 Proper sequence of operations involved in heat treatment. 8.2 Proper choice for placing the treatment in the manufacturing process.

CODE : 012L	
OBJECTIF	STANDARD
Statement of the Competency To do the engineering design of an object's fasteners.	**Achievement Context** • Individually and in teams. • Designing or modifying a simple object involving direct bonding, devices and mechanisms. • Given: – specifications, sketches and drawings; – catalogues and reference manuals, such as *The Machinery's Handbook*; – tables and nomographs.
Elements of the Competency	**Performance Criteria**
1. To interpret specifications.	1.1 Accurate formulation of the object's global, principal and technological functions. 1.2 Accurate determination of the forces and motions characteristic of the object. 1.3 Accurate identification of expected performance criteria. 1.4 Accurate identification of application constraints and manufacturing requirements related to the physical, human, technological and economic environment. 1.5 Meticulous production of basic and kinematic sketches. 1.6 Accurate interpretation of information in French.
2. To characterize in detail an object's fasteners.	2.1 Proper differentiation among the fastening methods set out in the technical documentation. 2.2 Methodical study of possible fastening methods, using problem-solving strategies. 2.3 Proper choice of fastening methods. 2.4 Accurate determination of locking method, according to the fasteners. 2.5 Clear sketch of the steps taken to assemble the object.

CODE : 012L	
3. To choose fastening devices and mechanisms.	3.1 Accurate calculation of required strength. 3.2 Proper choice of materials, according to specifications and calculations. 3.3 Accurate calculation of the dimensions of fastening devices and mechanisms. 3.4 Proper choice of various fastening devices and mechanisms from the catalogues, according to requirements and manufacturing processes.
4. To evaluate the design.	4.1 Methodical analysis of the value of the chosen fastening methods. 4.2 Conformity of solutions with specifications. 4.3 Accuracy of operating dimensions, according to the quality required.
5. To sketch the object and its fasteners.	5.1 Proper layout of the object in the sketch. 5.2 Accurate determination of required views and sections. 5.3 Clean, neat lines in the assembly and detail drawings. 5.4 Complete, written list of materials.

CODE : 012M

HARMONIZATION

This competency is equivalent to Module 5 of ***Industrial Drafting*** (DVS).

OBJECTIF	STANDARD
Statement of the Competency To use a computerized work station.	**Achievement Context** • Given: - a computerized work station, connected to a network and the information highway; - a word processing application and a spreadsheet; - English and French software; - relevant technical documentation.
Elements of the Competency	**Performance Criteria**
1. To prepare the work station.	1.1 Accurate identification of a computerized work station's components. 1.2 Accurate identification and localization of a computer's components and peripherals. 1.3 Meticulous checking of connections. 1.4 Functional and ergonomic organization of work station. 1.5 Proper formatting of diskettes.
2. To use basic functions of an operating system.	2.1 Proper use of the main functions of a graphic environment, such as windows, dialogue boxes, and menu, tool and scroll bars. 2.2 Proper procedures for creating, saving and printing documents. 2.3 Proper procedures for navigation and data transfer from one application to another. 2.4 Proper use of the main file management functions for various media, such as hard disks, diskettes and CD-ROMs. 2.5 Proper procedures for compressing and decompressing files. 2.6 Proper personalization of graphic environment, according to needs. 2.7 Proper shut-down procedures.

CODE : 012M	
3. To solve software problems, using the "Help" function.	3.1 Efficient search. 3.2 Correct interpretation and application of solutions. 3.3 Accurate translation of French software terminology, if applicable.
4. To produce a short document, using a word processing application.	4.1 Relevant choice and use of basic formatting tools. 4.2 Proper use of commands for: - modifying a text; - formatting; - page numbering; - creating a table; - using a dictionary; - inserting page and section breaks.
5. To produce a document, using a spreadsheet.	5.1 Relevant choice and use of basic formatting tools. 5.2 Proper use of commands for: - creating a worksheet; - copying and moving cells; - entering and copying data; - modifying data; - modifying rows and columns; - calculating data. 5.3 Proper use of anti-virus application.
6. To use the information highway.	6.1 Proper choice of communication software functions. 6.2 Efficient navigation to search for information. 6.3 Proper procedures to create bookmarks. 6.4 Proper procedures to process e-mail. 6.5 Proper procedures to download and print texts, drawings and images.

CODE : 012N

HARMONIZATION

This competency is equivalent to Module 6 of ***Industrial Drafting*** (DVS). The content of competencies 012G, 012N and 012U of the present program corresponds to competency 011U of ***Aircraft Manufacturing Technology*** (DEC).

OBJECTIF	STANDARD
Statement of the Competency To produce detail drawings of mechanical components.	**Achievement Context** • For an object having no fastening devices or drive components. • For orthographic projection drawings requiring sectional and auxiliary views. • Given: – annotated preliminary views in English and French; – a computerized work station including a plotter; – a computer-aided drafting (CAD) application; – technical documentation in English and French.
Elements of the Competency	**Performance Criteria**
1. To plan the work.	1.1 Accurate interpretation of lines, notes and dimensions of the preliminary drawing. 1.2 Proper choice of views, cutaway views, sections and auxiliary views. 1.3 Ergonomic layout of computerized work station. 1.4 Accurate definition of the parameters of the electronic sheet, according to the required system of measurement. 1.5 Proper representation of component positioning and relevant views in sketch form.
2. To draw the orthographic projection of the component.	2.1 Proper and optimum use of the basic commands of the application, including creating and inserting blocks. 2.2 Proper layout of orthographic projection. 2.3 Concordance of the various orthographic projections. 2.4 Correspondence between the orthographic projection and the perspective drawing. 2.5 Proper layout of details, according to the dimensions written in the preliminary drawing. 2.6 Observance of drafting standards and conventions.

CODE : 012N	
3. To draw sectional views.	3.1 Proper layout of sectional views. 3.2 Concordance of the various sectional views. 3.3 Correspondence between sectional views and orthographic views. 3.4 Observance of standards related to symbols for materials. 3.5 Proper layout of details according to the dimensions written in the preliminary drawing. 3.6 Observance of drafting standards and conventions. 3.7 Proper use of basic CAD application commands.
4. To draw auxiliary views.	4.1 Proper choice of type of auxiliary views. 4.2 Proper layout of auxiliary views. 4.3 Concordance of the various auxiliary views. 4.4 Correspondence between auxiliary views and orthographic views. 4.5 Proper layout of details according to the dimensions written in the preliminary drawing. 4.6 Observance of drafting standards and conventions. 4.7 Proper use of basic CAD application commands.
5. To write in the dimensioning and complementary information.	5.1 Accurate calculation of dimensions. 5.2 Observance of dimensioning standards. 5.3 Correct use of symbols.
6. To verify drawings.	6.1 Observance of procedure for verifying and approving correctness of drawing. 6.2 Conformity of drawing with data provided.
7. To print drawings.	7.1 Proper preparation of materials. 7.2 Accurate determination of relevant parameters. 7.3 Correspondence between print and established parameters. 7.4 Correspondence between length of lines and scale, after printing.
8. To archive documents.	8.1 Proper document management. 8.2 Proper choice of archiving method.

CODE : 012P

HARMONIZATION

This competency is equivalent to Module 12 of ***Industrial Drafting*** (DVS) and Module 5 of ***Machining Techniques*** (DVS).

OBJECTIF	STANDARD
Statement of the Competency To take and interpret measurements.	**Achievement Context** • Given: – objects to be measured; – assembly or detail drawings in metric and imperial units of measurement; – measuring instruments and devices; – a scientific calculator; – inspection records; – cleaning products and lubricants. • Using various reference materials, such as: – The Machinery's Handbook; – tables and nomographs; – conversion tables.
Elements of the Competency	**Performance Criteria**
1. To plan the work.	1.1 Understanding of the context and characteristics of the object to be measured. 1.2 Accurate interpretation of the information contained in the drawings and estimates: - dimensions; - tolerances; - instructions. 1.3 Appropriate choice of measuring instruments and devices in accordance with the work to be carried out. 1.4 Proper positioning of part and choice of fastenings for the part to be measured. 1.5 Organized arrangement of instruments and devices.
2. To prepare the measuring instruments and devices, as well as the part to be measured.	2.1 Meticulous inspection of instruments and devices. 2.2 Accurate calibration and adjustment of measuring instruments and devices. 2.3 Proper preparation of part. 2.4 Cleanliness of work area.

CODE : 012P	
3. To measure parts of different shapes.	3.1 Accurate calculation of information relevant for measurement reading. 3.2 Proper use of measuring instruments and devices. 3.3 Accurate reading of dimensional and geometric measurements. 3.4 Accurate conversion of dimensions to the metric and imperial systems of measurement. 3.5 Accurate interpretation of measurement readings. 3.6 Accurate recording of results.
4. To inspect the physical characteristics of parts.	4.1 Proper use of: - optical comparators; - roughness and hardness testers. 4.2 Accurate readings. 4.3 Observance of technique for converting scales. 4.4 Accurate recording of results.
5. To sketch a part.	5.1 Proper choice of views. 5.2 Accurate and proportional representation of part. 5.3 Accurate recording of dimensioning and relevant information.
6. To perform regular maintenance on measuring instruments and devices.	6.1 Meticulous cleaning of instruments and devices. 6.2 Lubrication of instruments and devices at the appropriate points. 6.3 Proper storage of instruments and devices.

CODE : 012Q

HARMONIZATION

This competency is equivalent to Modules 9 and 10 of ***Machining Techniques*** (DVS). The content of competencies 012Q and 012R of the present program corresponds to competency 011S of ***Aircraft Manufacturing Technology*** (DEC).

OBJECTIF	STANDARD
Statement of the Competency To operate a conventional lathe.	**Achievement Context** • For machining simple prototypes, involving at least turning, roughing, facing, grooving, tapering, threading, boring and reaming. • Given: – a conventional lathe; – detail drawings, a process sheet and operation manuals; – bar stock of ferrous or non-ferrous material; – cutting tools, tool holders and work- holding accessories; – individual protective gear; – tool catalogues and reference manuals in English and French, such as *The Machinery's Handbook*; – appropriate testing instruments; – WHMIS index cards. • Following occupational health and safety rules.
Elements of the Competency	**Performance Criteria**
1. To interpret drawings and technical documentation.	1.1 Thorough reading of the dimensional and geometric limits related to surfaces to be machined. 1.2 Accurate evaluation of the capacity and limitations of the machine tool, according to the object to be machined. 1.3 Accurate determination of the material, tools and work-holding accessories, according to the surfaces to be machined and the operations to be performed. 1.4 Accurate interpretation. 1.5 Correct interpretation of information in French.

CODE : 012Q	
2. To adapt a process sheet to the type of machine tool used.	2.1 Complete description of the types of conventional lathes: - components; - kinematic chain; - coordinate system; - capacities and limitations. 2.2 Accurate sketch of machining operations. 2.3 Accurate calculation of the technological and mechanical parameters of each section. 2.4 Realistic interpretation of cutting forces and straggling affecting the precision of the machining operations. 2.5 Proper adaptation of the various machining operations, according to the machine tool used. 2.6 Proper choice of cutting tools, according to the surface to be machined. 2.7 Meticulous recording of the modifications on the process sheet using proper technical terminology.
3. To plan the work.	3.1 Detailed visual inspection of the machine tool components. 3.2 Precise adjustment of machine tool, according to the technological and mechanical parameters of the cut. 3.3 Meticulous grinding, installation and adjustment of cutting tools, according to the operations to be performed. 3.4 Safe handling and installation of work-holding accessories. 3.5 Meticulous, safe installation of workpiece.

CODE : 012Q	
4. To machine a prototype on a lathe.	4.1 Accurate determination of the risks associated with shop work, and preventive steps to be taken. 4.2 Appropriate dry run. 4.3 Proper observance of sequence of machining operations. 4.4 Observance of techniques for performing first cut and subsequent cuts. 4.5 Safe use of machine tool. 4.6 Observance of appropriate safety measures. 4.7 Critical analysis of machining errors. 4.8 Proper adjustments and corrections. 4.9 Disassembling and meticulous deburring of parts.
5. To control the quality of the machined part.	5.1 Proper choice and calibration of measurement instruments. 5.2 Safe installation of work-holding accessories for verification of the part. 5.3 Structured analysis of dimensional and geometric errors, as well as of the quality of the surfaces. 5.4 Thorough evaluation of quality of work. 5.5 Precise and complete presentation of results, free from spelling mistakes.
6. To tidy and clean the work area.	6.1 Proper determination of the risks inherent in handling hazardous materials. 6.2 Systematic disassembling of all tool parts. 6.3 Meticulous cleaning and storing of components of the machine tool. 6.4 Careful tidying of work area. 6.5 Appropriate recording of signs of wear and defects of the machine tool. 6.6 Thorough lubrication of machine tool. 6.7 Proper completion of maintenance report.

CODE : 012R

HARMONIZATION

This competency is equivalent to Module 11 of ***Machining Techniques*** (DVS). The content of competencies 012Q and 012R of the present program corresponds to competency 011S of ***Aircraft Manufacturing Technology*** (DEC).

OBJECTIF	STANDARD
Statement of the Competency To operate a conventional milling machine.	**Achievement Context** • For machining simple prototypes, involving surfacing, curving, drilling, boring, and face, slab and end milling. • Given: – a conventional milling machine; – detail drawings, a process sheet and operation manuals; – bar stock of ferrous or non-ferrous material; – cutting tools, tool holders and work- holding accessories; – individual protective gear; – tool catalogues and reference manuals in English and French, such as *The Machinery's Handbook*; – appropriate testing instruments. • Following occupational health and safety rules.
Elements of the Competency	**Performance Criteria**
1. To interpret drawings and technical documentation.	1.1 Thorough reading of the dimensional and geometric limits related to surfaces to be machined. 1.2 Accurate evaluation of the capacity and limitations of the machine tool, according to the object to be machined. 1.3 Accurate determination of the material, tools and work-holding accessories, according to the surfaces to be machined and the operations to be performed. 1.4 Accurate interpretation. 1.5 Correct interpretation of information in French.

CODE : 012R	
2. To adapt a process sheet to the type of machine tool used.	2.1 Complete description of the types of conventional milling machines: - components; - kinematic chain; - coordinate system; - capacities and limitations. 2.2 Accurate sketch of machining operations. 2.3 Accurate calculation of the technological and mechanical parameters of each section. 2.4 Realistic interpretation of cutting forces and straggling affecting the precision of the machining operations. 2.5 Proper adaptation of the various machining operations, according to the machine tool used and the shape of the part. 2.6 Proper choice of cutting tools, according to the geometric surface to be machined. 2.7 Meticulous recording of the modifications on the process sheet, using the correct technical terminology.
3. To plan the work.	3.1 Detailed visual inspection of the machine tool components. 3.2 Precise adjustment of machine tool, according to the technological and mechanical parameters of the cut. 3.3 Meticulous grinding, installation and adjustment of cutting tools, according to the operations to be performed. 3.4 Safe handling and installation of work-holding accessories. 3.5 Meticulous, safe installation of workpiece.
4. To machine a prototype on a conventional milling machine.	4.1 Appropriate dry run. 4.2 Proper observance of sequence of machining operations. 4.3 Observance of techniques for performing the first cut and subsequent cuts. 4.4 Safe use of machine tool. 4.5 Observance of appropriate safety measures. 4.6 Critical analysis of machining errors. 4.7 Appropriate adjustments and corrections. 4.8 Disassembling and meticulous deburring of parts.

CODE : 012R	
5. To control the quality of the machined part.	5.1 Proper choice and calibration of measurement instruments. 5.2 Safe installation of work-holding accessories for verification of the part. 5.3 Structured analysis of dimensional and geometric errors, as well as of the quality of the surfaces. 5.4 Thorough evaluation of quality of work. 5.5 Precise and complete presentation of results, free from spelling mistakes.
6. To tidy and clean the work area.	6.1 Systematic disassembling of all tool parts. 6.2 Meticulous cleaning and storing of the components of the machine tool. 6.3 Careful tidying of work area. 6.4 Appropriate recording of signs of wear and defects of the machine tool. 6.5 Thorough lubrication of the components of the machine tool. 6.6 Proper completion of maintenance report.

CODE : 012S

HARMONIZATION

This competency is equivalent to Module 13 of ***Industrial Drafting*** (DVS). The content of competencies 012S and 012T of the present program corresponds to competency 011T of ***Aircraft Manufacturing Technology*** (DEC).

OBJECTIF	STANDARD
Statement of the Competency To determine dimensional tolerances.	**Achievement Context** • For a mechanical object comprising an assembly of parts. • Given: – technical drawings and pre-established data; – existing industrial standards; – a computerized work station; – relevant technical documentation in English and French.
Elements of the Competency	**Performance Criteria**
1. To gather the information.	1.1 Accurate interpretation of assembly drawing and detail drawings. 1.2 Detailed recording of dimensions.
2. To analyze the operating conditions of the object.	2.1 Complete recording of relevant operating conditions. 2.2 Accurate determination of the parameters related to the thickness of the material. 2.3 Correct attribution of values according to the operating conditions recorded.
3. To establish chains of dimensions.	3.1 Meticulous drawing of chains of dimensions in vector form. 3.2 Observance of operating conditions when drawing the chains of dimensions. 3.3 Chains of dimensions made up of a minimum of vectors. 3.4 Detailed recording of chains of dimensions on the drafts.

CODE : 012S	
4. To establish dimensioning values.	4.1 Complete recording of dimensions imposed by the manufacturers. 4.2 Accurate determination of dimensioning values according to the dimensions imposed and the chains of dimensions established. 4.3 Meticulous division of linear tolerances. 4.4 Accurate calculation of minimum and maximum dimensioning, according to operating conditions. 4.5 Accurate calculation of transfers of linear dimensioning. 4.6 Detailed recording of dimensioning values and their tolerances.
5. To record the dimensioning on the drawings.	5.1 Accurate recording of dimensioning values on the drawings. 5.2 Meticulous inspection of dimensions of parts.

CODE : 012T

HARMONIZATION

The content of competencies 012S and 012T corresponds to competency 011T of ***Aircraft Manufacturing Technology*** (DEC).

OBJECTIF	STANDARD
Statement of the Competency To determine the geometric tolerances required for an assembly.	**Achievement Context** • For a mechanical object comprising an assembly of parts. • Given: – technical drawings and pre-established data; – existing industrial standards; – a computerized work station; – relevant technical documentation in English and French.
Elements of the Competency	**Performance Criteria**
1. To gather the information.	1.1 Detailed recording of dimensions. 1.2 Accurate interpretation of the assembly drawing and the detail drawings.
2. To analyze geometric operating conditions.	2.1 Proper understanding of kinematic conditions. 2.2 Proper analysis of an assembly's least favourable conditions.
3. To choose the type of geometric tolerances.	3.1 Proper choice of tolerance type with regard to orientation, position and backlash, given the kinematic conditions of the object. 3.2 Proper choice of tolerance type with regard to orientation and position, given the fastening devices of the object. 3.3 Proper choice of shape tolerance, according to the operation of the mechanism's parts. 3.4 Proper choice of geometric tolerancing references.
4. To calculate the geometric tolerances of dimensioning.	4.1 Understanding of the possibilities and limitations in manufacturing processes. 4.2 Due consideration given to projection of the tolerance, as needed. 4.3 Proper choice of method of calculation. 4.4 Accurate calculation of geometric dimensions. 4.5 Accurate calculation of transfers of geometric dimensions.

CODE : 012T	
5. To record geometric tolerances on the drawings.	5.1 Accurate recording of dimensioning values on the drawings. 5.2 Proper placing of the tolerance on the drawing. 5.3 Observance of standards. 5.4 Meticulous inspection of all relevant dimensions.

CODE : 012U

HARMONIZATION

This competency is equivalent to Module 10 of ***Industrial Drafting*** (DVS). The content of competencies 012G, 012N and 012U of the present program corresponds to competency 011U of ***Aircraft Manufacturing Technology*** (DEC).

OBJECTIF	STANDARD
Statement of the Competency To produce assembly drawings.	**Achievement Context** • Drawing a mechanical object made up of fasteners and a maximum of 15 parts. • Given: – a sketch and detail drawings in English and French; – a computerized work station; – a computer-aided drafting (CAD) application; – relevant technical documentation in English and French.
Elements of the Competency	**Performance Criteria**
1. To interpret detail drawings.	1.1 Accurate description of the function of each part illustrated on the drawings. 1.2 Accurate identification of the layout method of the parts. 1.3 Accurate description of the object's function. 1.4 Correct translation of the French technical terms used in drawings.
2. To plan the work.	2.1 Proper choice of reference materials. 2.2 Accurate determination of the object's orientation, according to: - use; - relationship to another object. 2.3 Proper choice of views. 2.4 Proper layout of views in sketch form. 2.5 Functional and ergonomic organization of work station.
3. To draw the parts to be manufactured.	3.1 Observance of dimensions and scale. 3.2 Accurate layout of parts. 3.3 Proper use of CAD software specialized commands.

CODE : 012U	
4. To insert commercialized parts.	4.1 Efficient research using various documents, catalogues and electronic media. 4.2 Optimum use of CAD software special commands for importing. 4.3 Observance of scale dimensions. 4.4 Accurate layout of parts.
5. To record dimensioning and complementary information.	5.1 Accurate calculations of size and location dimensions. 5.2 Observance of dimensioning standards. 5.3 Complete and accurate list of terms. 5.4 Observance of manufacturing sequence for recording the parts in the bill of material. 5.5 Accurate recording of information related to the assembly. 5.6 Accurate use of symbols and notations. 5.7 Title block properly completed. 5.8 Uniformity of language and system of measurement used in notations.
6. To verify the drawing.	6.1 Observance of procedure for verifying and approving correctness of drawing. 6.2 Conformity of drawing with the initial data.
7. To archive and print documents.	7.1 Efficient file management. 7.2 Proper choice of archiving method. 7.3 Observance of printing procedure.

CODE : 012V

HARMONIZATION

This competency is equivalent to Modules 20 and 22 of ***Machining Techniques*** (DVS) and to Modules 5 and 7 of ***Numerical Control Machine Tool Operation*** (AVS).

OBJECTIF	STANDARD
Statement of the Competency To operate a numerical control machine tool.	**Achievement Context** • Machining a simple prototype. • Preparing a numerical control machine tool for production. • Given: – a milling machine and a numerical control lathe; – an existing machining program; – detail drawings, a process sheet and operation manuals; – bar stock of ferrous or non-ferrous material; – cutting tools, tool holder and work-holding accessories; – individual protective gear; – tool catalogues and reference materials in English and French, such as *The Machinery's Handbook*; – appropriate testing instruments. • Following occupational health and safety rules.
Elements of the Competency	**Performance Criteria**
1. To interpret the drawings and technical documentation.	1.1 Thorough reading of relevant information. 1.2 Correct interpretation of information in French.
2. To adapt a process sheet to the type of machine tool used.	2.1 Complete description of numerical control machine tools, with regard to their: - components; - kinematic chains; - coordinate system; - capacity and limitations; - types of controllers. 2.2 Proper choice of cutting tools, according to the surface to be machined. 2.3 Meticulous recording of modifications on the process sheet, using the correct technical terminology.

CODE : 012V	
3. To plan the work.	3.1 Detailed visual inspection of the components of the machine tool. 3.2 Observance of procedure for starting up the machine tool. 3.3 Meticulous adjustment of cutting tools in tool holders. 3.4 Careful loading of tools in tool magazine. 3.5 Careful loading of machining program. 3.6 Proper visual inspection of program. 3.7 Meticulous introduction of tool compensations into the program.
4. To machine a prototype on a numerical control machine.	4.1 Careful zero setting of machine tool. 4.2 Detailed graphic simulation of toolpaths. 4.3 Real simulation of toolpaths in automatic or semi-automatic mode. 4.4 Safe use of machine tool. 4.5 Observance of appropriate personal safety measures. 4.6 Meticulous analysis of incidents related to the running of the machine. 4.7 Appropriate adjustments and corrections. 4.8 Strict quality control of the part.
5. To tidy and clean the work area.	5.1 Systematic disassembling and storage of all tool parts. 5.2 Appropriate recording of signs of wear and defects of machine tool. 5.3 Thorough lubrication of machine tool. 5.4 Careful tidying of work area. 5.5 Proper completion of maintenance report.

CODE : 012W

HARMONIZATION

This competency is equivalent to Module 21 of ***Machining Techniques*** (DVS*)* and Module 6 of ***Numerical Control Machine Tool Operation*** (AVS*)*. The content of competencies 012W, 0133 and 0135 of the present program corresponds to competency 011Z of ***Aircraft Manufacturing Technology*** (DEC).

OBJECTIF	STANDARD
Statement of the Competency To program a machining centre manually.	**Achievement Context** • Given: – drawings of simple parts to be machined in metric or imperial units of measurement; – process sheets; – instructions; – industrial numerical control machining centres or milling machines or a microcomputer with a text editor and communication software; – a scientific calculator. • Using various reference materials, such as: – The Machinery's Handbook; – tables and nomographs; – technical manuals; – tool catalogues; – programming manuals. • Following occupational health and safety rules.
Elements of the Competency	**Performance Criteria**
1. To identify, in the drawings, process sheet and manuals, the information needed for the task.	1.1 Thorough identification of information needed for the task. 1.2 Accurate interpretation of information. 1.3 Accurate identification of reference surfaces. 1.4 Accurate English and French terminology.
2. To write the program.	2.1 Proper choice of zero position of workpiece. 2.2 Accurate calculation of cartesian and polar coordinates, as needed. 2.3 Determination of position of beginning and end of toolpath. 2.4 Structured development of program. 2.5 Accurate insertion of machining parameters: - rpm; - feed rate in units per minute. 2.6 Conformity with process sheet. 2.7 Observance of programming syntax.

CODE : 012W	
3. To edit the program using: – a microcomputer; – the machine tool controller.	3.1 Observance of procedure according to equipment used: - data entry; - data archiving; - data transmission. 3.2 Inclusion of all program data. 3.3 Accurate data entered.
4. To validate the program.	4.1 Conformity of program with drawing and instructions. 4.2 Detailed simulation of toolpaths: - graphic simulation; - dry run. 4.3 Detection of programming errors. 4.4 Appropriate corrections made. 4.5 Observance of archiving method. 4.6 Observance of time limits.

CODE : 012X

HARMONIZATION

This competency is equivalent to Module 23 of ***Industrial Drafting*** (DVS), Module 15 of ***Machining Techniques*** (DVS) and Module 11 of ***Numerical Control Machine Tool Operation*** (AVS), as well as competency 0127 of ***Aircraft Manufacturing Technology*** (DEC).

OBJECTIF	STANDARD
Statement of the Competency To adapt to new types of work organization.	**Achievement Context** • Working in a team. • Given complete information on the operation of a manufacturing company. • Using relevant documentation. • In an atmosphere of respect and openness.
Elements of the Competency	**Performance Criteria**
1. To recognize the production management approaches of the company and their effects on the type of work organization.	1.1 Recognition of the company's management philosophy, particularly Taylorism and added value. 1.2 Proper description of preferred type of structural organization: - hierarchical organization; - semi-autonomous teams; - autonomous teams. 1.3 Recognition of the company's production process. 1.4 Appreciation of the effects of management approaches on production and on the evolution of tasks in the company.
2. To recognize the means used to promote the continual improvement of productivity.	2.1 Accurate differentiation among the instruments or techniques used in the company. 2.2 Relevant associations between the means used and the company's ability to meet the requirements of the new economy, such as: - improvement of the time required to respond to market needs; - economies of scale; - elimination of waste. 2.3 Recognition of the contribution of personnel to the improvement of productivity.

CODE : 012X	
3. To communicate verbally with colleagues.	3.1 Choice of types of questions required to obtain relevant information. 3.2 Proper reformulation of areas of agreement and disagreement in a discussion. 3.3 Proper reformulation and reflection of message. 3.4 Constructive and accurate feedback to: - encourage improvement in behaviour; - recognize and encourage the contribution of colleagues. 3.5 Relevant and persuasive expression of their point of view. 3.6 Understanding of comments that might cause controversy. 3.7 Use of an effective approach to deal with emotionally charged behaviour.
4. To solve problems related to work organization.	4.1 Choice of tools and techniques in accordance with the complexity of the problem to be solved. 4.2 Clear description of the problem. 4.3 Determination of the causes and consequences of the problem. 4.4 Choice of best solution in accordance with established criteria. 4.5 Realistic plan of action. 4.6 Follow-up mechanisms clearly defined and scheduled.
5. To work in a multidisciplinary team.	5.1 Determination of the goals of the team and the results to be attained in accordance with the company's mission and values. 5.2 Consensus on team rules. 5.3 Determination of the responsibilities of each team member. 5.4 Proper planning of work. 5.5 Consensus decision making. 5.6 Recognition of participation style of team members. 5.7 Description of favourable and unfavourable factors for each stage of the work.

CODE : 012Y

HARMONIZATION

The content of competencies 012Y and 0134 of the present program corresponds to competency 012Z of ***Aircraft Manufacturing Technology*** (DEC).

OBJECTIF	STANDARD
Statement of the Competency To establish the sequence of operations for manufacturing processes.	**Achievement Context** • For the following processes using metal or plastic parts: moulding, shaping, cutting, welding, assembly by bonding, and other emerging technologies. • Given: – specifications and drawings; – reference manuals; – tables, nomographs and catalogues.
Elements of the Competency	**Performance Criteria**
1. To determine the steps involved in preparing to mould a metal part.	1.1 Thorough reading of dimensions, tolerances and production parameters, using the technical documentation. 1.2 Proper choice of moulding process in accordance with: - manufacturing conditions; - characteristics of the part; - advantages and disadvantages of the various processes; - cost. 1.3 Accurate calculation of moulding process. 1.4 Relevant analytical and graphic representation of the workpiece, using detail drawings. 1.5 Logical sequence of operations: - manufacturing the mould or cast; - moulding/casting the parts; - recovering the part from the mould/cast. 1.6 Proper choice of specific treatments to be used. 1.7 Clearly written worksheet, showing the relevant steps used in preparing the part according to the manufacturing process.

CODE : 012Y	
2. To determine the steps involved in preparing to mould a plastic part.	2.1 Thorough reading of the dimensions and tolerances of the parts to be manufactured as well as of the parameters of production. 2.2 Proper choice of moulding process. 2.3 Accurate calculations related to the moulding process. 2.4 Relevant analytical and graphic adaptations of detail drawings. 2.5 Logical sequence of operations: - manufacturing the mould; - casting the parts; - recovering the part from the mould. 2.6 Clearly written worksheet, showing the relevant steps used in preparing the part according to the manufacturing process.
3. To determine the steps involved in preparing a metal part to be shaped using a hot or cold work process.	3.1 Thorough reading of the dimensions and tolerances of the parts to be manufactured, as well as of the parameters of production. 3.2 Proper choice of shaping process. 3.3 Accurate calculations related to the process. 3.4 Relevant analytical and graphic representation of the workpiece, as well as of the intermediate deformation operations. 3.5 Logical sequence of operations in manufacturing form tools. 3.6 Logical sequence of operations in shaping and finishing parts. 3.7 Proper choice of specific treatments to be used. 3.8 Clearly written worksheet, showing the relevant steps used in preparing the part according to the manufacturing process.

CODE : 012Y	
4. To determine the steps involved in preparing a metal part to be cut.	4.1 Thorough reading of the dimensions and tolerances of the parts to be manufactured, as well as of the parameters of production. 4.2 Proper choice of cutting process. 4.3 Accurate calculations related to the cutting process. 4.4 Relevant analytical and graphic representation of the blank and the intermediate cutting operations. 4.5 Accurate differentiation between the cutting tools and their respective uses. 4.6 Logical sequence of cutting operations. 4.7 Clearly written worksheet, showing the relevant steps used in preparing the part according to the manufacturing process.
5. To determine the steps involved in the preparation of a metal part to be assembled by welding.	5.1 Thorough reading of the dimensions and tolerances of the parts to be manufactured, as well as parameters of production. 5.2 Proper choice of welding process. 5.3 Accurate calculations related to the welding process. 5.4 Logical sequence of operations in preparing parts and welding. 5.5 Proper choice of specific treatments to be used. 5.6 Accurate recording of a worksheet, showing the relevant steps used in preparing the part according to the manufacturing process.
6. To determine the steps involved in the preparation of parts to be assembled using fastening devices.	6.1 Thorough reading of the dimensions and tolerances of the parts to be manufactured, as well as of the parameters of production. 6.2 Proper choice of assembly process. 6.3 Accurate calculations related to the process. 6.4 Relevant analytical and graphic adaptation of detail drawings. 6.5 Logical sequence of operations in preparing and assembling the parts. 6.6 Clearly written worksheet, showing the relevant steps used in preparing the part according to the manufacturing process.

CODE : 012Z

OBJECTIF	STANDARD
Statement of the Competency To control the quality of products.	**Achievement Context** • Individually and in teams. • For a medium production run of a simple object made up of complex parts of varying dimensions. • Given: – drawings and manufacturing process sheets; – quality standards; – statistical process control software; – measurement instruments.
Elements of the Competency	**Performance Criteria**
1. To determine the method of control.	1.1 Accurate formulation of the constraints pertaining to the characteristics of the planned production. 1.2 Proper choice of a qualitative or quantitative method in accordance with the applied quality standard. 1.3 Method adapted to type of production.
2. To establish a control procedure.	2.1 Proper choice of critical production operations to undergo quality control. 2.2 Proper choice of types of controls to be done, such as dimensional, geometric and roughness controls. 2.3 Relevant choice of sampling. 2.4 Accurate determination of sampling frequency. 2.5 Proper organization of inspection sequences.
3. To organize inspection stations.	3.1 Proper choice of control techniques for each inspection sequence. 3.2 Proper choice of instruments and material. 3.3 Thorough, safe and functional organization of work area with a view to carrying out the inspection. 3.4 Meticulously planned control sheets, containing all necessary information.

CODE : 012Z	
4. To perform quality control of the first-off parts of a production.	4.1 Thorough calibration of control instruments. 4.2 Accurate recording of measurements. 4.3 Good judgment related to: - quality of manufactured parts; - assembly of manufactured parts; - characteristics of materials; - conformity of parts with specifications. 4.4 Thorough statistical evaluation of results. 4.5 Accurate evaluation of the capacity of the machine to meet required tolerances. 4.6 Correct planning of follow-up.
5. To plan testing of products.	5.1 Accurate interpretation of specifications and estimates. 5.2 Proper organization of a test method in accordance with expected performance criteria. 5.3 Thorough planning of materials needed for the test.
6. To produce written reports.	6.1 Appropriate recommendations with regard to preventive and corrective measures. 6.2 Observance of program standards ensuring quality. 6.3 Neatly prepared, thorough and complete reports. 6.4 Proper determination of recipients of the reports.

CODE : 0130	
OBJECTIF	STANDARD
Statement of the Competency To modify the design concept of the components of a piece of industrial equipment.	**Achievement Context** • Individually and in teams. • Replacing defective or inappropriate machine components. • For components of machines used in motion transfer. • Given: – sketches of the components and specifications; – real parts; – a computerized work station connected to the information highway; – relevant software, including an electronic library; – relevant technical documentation in English and French.
Elements of the Competency	**Performance Criteria**
1. To analyze the specifications and sketches.	1.1 Accurate identification of the various components of the industrial systems involved, their functions and characteristics. 1.2 Accurate formulation of expectations and constraints related to the need. 1.3 Accurate reading of required performance criteria. 1.4 Accurate formulation of the mechanical functions of the object, such as positioning, maintaining position, guiding devices, transmission and motion transfer. 1.5 Accurate determination of the characteristic forces and movement of the object.
2. To plan the work.	2.1 Observance of problem-solving strategies. 2.2 Realistic determination of tasks and time limits. 2.3 Efficient search for commercially available parts. 2.4 Structured archiving of data gathered. 2.5 Complete reading of measurements.

CODE : 0130	
3. To establish the components' service conditions.	3.1 Accurate and relevant calculations of strength, loads, rotational speed and tolerances. 3.2 Due consideration given to operating conditions, required performances and other data related to the project. 3.3 Optimum choice of materials. 3.4 Accurate interpretation of tables and nomographs.
4. To choose components from catalogues.	4.1 Objective assessment of the technological and economic applicability of the various solutions considered, based on need. 4.2 Optimum choice of components. 4.3 Due consideration given to initial data. 4.4 Establishment of maintenance instructions, as per the catalogues.
5. To sketch the solution.	5.1 Proper choice of required types of sketches. 5.2 Clear, meaningful representation of component. 5.3 Observance of conventional symbols and sketching.
6. To verify the quality of the work.	6.1 Conformity of sketches with initial data and standards. 6.2 Modifications respecting safety standards. 6.3 Accuracy of corrections.
7. To present the proposal.	7.1 Rational explanation of the procedure followed in the design of the object. 7.2 Clear, concise presentation of the proposal with sketches. 7.3 Relevant and persuasive justification of choices made in the design of the object. 7.4 Openness to comments. 7.5 Quality and relevance of adaptations.

CODE : 0131

HARMONIZATION

This competency is equivalent to competency 012A of ***Aircraft Manufacturing Technology*** (DEC).

OBJECTIF	STANDARD
Statement of the Competency To do the engineering design of the tools necessary for a manufacturing project.	**Achievement Context** • Individually and in teams. • Designing simple tools that meet the needs of a medium production run, such as work-holding accessories, cutting tools, templates and punch and die tools. • Given: – shop drawings, sketches and a manufacturing process sheet for the object to be manufactured; – operation manuals; – catalogues of parts and reference manuals in English and French; – relevant software.
Elements of the Competency	**Performance Criteria**
1. To gather data from drawings and basic documents.	1.1 Accurate interpretation of detail drawings and shop drawings. 1.2 Thorough recording of tool requirements according to the process sheet. 1.3 Accurate evaluation of dimensional and geometric measurements. 1.4 Accurate determination of the capacities and limitations of the machinery, according to specifications.
2. To develop the tools' initial design concept.	2.1 Accurate determination of the types of tools in accordance with the range of application. 2.2 Accurate determination of the types of tools needed. 2.3 Accurate calculation of the relevant technological and mechanical parameters for the type of tools required. 2.4 Objective comparative study of similar, commercially available tools. 2.5 Tool project adapted to needs and constraints. 2.6 Clear representation of tools in sketch form.

CODE : 0131	
3. To design the different parts of the tools.	3.1 Detailed analysis of the parts of the process sheet requiring the designing of tools. 3.2 Detailed designing of the various parts in accordance with technological, economic and human criteria. 3.3 Proper choice of commercially available parts, found in catalogues. 3.4 Accurate calculation of workpiece positioning. 3.5 Observance of engineering and safety standards. 3.6 Accurate calculation of the tool's dimensional and geometric measurements. 3.7 Complete and representative assembly and detail drawings.
4. To verify the work.	4.1 Conformity of tool drawings with initial criteria and data. 4.2 Appropriate corrections made.

CODE : 0132

OBJECTIF	STANDARD
Statement of the Competency To keep abreast of new technologies.	**Achievement Context** • Individually and in teams. • Studying new developments and methods of processing information on materials, manufacturing processes, designing methods, fasteners, mechanisms or software applications. • Given: – magazines, films, documentaries, videos, visits to companies, commercial exhibitions; – information networks, such as the Internet; – professional contacts.
Elements of the Competency	**Performance Criteria**
1. To research information on a given topic.	1.1 Observance of the procedure involved in carrying out efficient documentary research, in a library and the information highway. 1.2 Varied sources of information. 1.3 Proper application of efficient reading techniques to learn about new developments. 1.4 Documented list of professional organizations and contacts in the field. 1.5 Quality, relevance and originality of information gathered. 1.6 Methodical archiving of the information, according to the various technological domains.
2. To carry out a comparative study of the information gathered and present-day technologies.	2.1 Accurate interpretation of information in French. 2.2 Proper understanding of the qualitative and quantitative improvements to products and production. 2.3 Proper understanding of the economic effects of new technologies on manufacturing processes and techniques. 2.4 Proper association made with prior knowledge. 2.5 Thorough recording of technical characteristics.
3. To determine the applications of an emerging technology.	3.1 Relevance of applications to a manufacturing situation. 3.2 Classification and structured archiving of information, by field of application.

CODE : 0133

HARMONIZATION

This competency is equivalent to Module 19 of ***Machining Techniques*** (DVS) and Module 4 of ***Numerical Control Machine Tool Operation*** (AVS). The content of competencies 012W, 0133 and 0135 of the present program corresponds to competency 011Z of ***Aircraft Manufacturing Technology*** (DEC).

OBJECTIF	STANDARD
Statement of the Competency To program a numerical control lathe manually.	**Achievement Context** • Given: – drawings of simple parts to be machined in metric or imperial units of measurement; – process sheets; – instructions; – industrial numerical control lathes or a microcomputer with a text editor and communication software; – a scientific calculator. • Using various reference materials, such as: – *The Machinery's Handbook*; – tables and nomographs; – technical manuals; – tool catalogues; – programming manuals. • Following occupational health and safety rules.
Elements of the Competency	**Performance Criteria**
1. To identify, in the drawings, process sheet and manuals, the information needed for the task.	1.1 Thorough identification of information needed for the task. 1.2 Accurate interpretation of information. 1.3 Accurate identification of reference surfaces. 1.4 Accurate English and French terminology.
2. To write the program.	2.1 Proper choice of zero position of workpiece. 2.2 Accurate calculation of cartesian and polar coordinates, as needed. 2.3 Determination of position of beginning and end of toolpath. 2.4 Structured development of program. 2.5 Accurate insertion of machining parameters specific to turning: - cutting speed in units per minute; - feed rate in units per revolution. 2.6 Conformity with process sheet. 2.7 Observance of programming syntax.

CODE : 0133	
3. To edit the program using: - a microcomputer; - the machine tool controller.	3.1 Observance of procedure, in accordance with the materials used: – data entry; – data archiving; – data transmission. 3.2 Inclusion of all program data. 3.3 Accurate data entered.
4. To validate the program.	4.1 Conformity of program with drawing and instructions. 4.2 Detailed simulation of toolpaths: - graphic simulation; - dry run. 4.3 Detection of programming errors. 4.4 Appropriate corrections made. 4.5 Observance of archiving method. 4.6 Observance of time limits.

CODE : 0134

HARMONIZATION

The content of competencies 012Y and 0134 of the present program corresponds to competency 0129 of ***Aircraft Manufacturing Technology*** (DEC).

OBJECTIF	STANDARD
Statement of the Competency To develop a process sheet.	**Achievement Context** • Developing the process sheet of a simple object, made up of several parts. • Given: - specifications; - drawing sheets; - operation manuals; - estimates, presenting the steps in preparing the parts. • Using: - reference manuals; - catalogues; - tables and nomographs.
Elements of the Competency 1. To analyze the technical documentation.	**Performance Criteria** 1.1 Complete recording of shapes, dimensions and tolerances of the parts to be manufactured. 1.2 Complete recording of manufacturing conditions established in the specifications, such as speed, series type and performance criteria. 1.3 Detailed recording of the capacities of the machines in the shop, using operation manuals. 1.4 Detailed analysis of machine running time.

CODE : 0134	
2. To establish sequence of manufacturing operations.	2.1 Detailed set-up of the operations required to machine surfaces. 2.2 Proper sequence of operations, in accordance with dimensional, geometric and economic constraints. 2.3 Proper choice of manufacturing processes. 2.4 Proper sequence of operations related to the various treatments established on the drawings. 2.5 Logical grouping of operations, according to the manufacturing process chosen. 2.6 Accurate calculation of manufacturing parameters. 2.7 Detailed process sheet presented in the form of a project. 2.8 Persuasive presentation of project to the relevant parties. 2.9 Openness to comments. 2.10 Appropriate modifications made to process sheet.
3. To determine the parameters for the tools necessary for the manufacturing process.	3.1 Proper choice of manufacturing tools, including tools, work-holding accessories, and templates. 3.2 Choice of ideal isostatic positioning of the part for each manufacturing operation. 3.3 Accurate calculation of forces exerted on tools. 3.4 Proper choice of clamps. 3.5 Accurate and thoroughly dimensional sketch of the manufacturing work-holding accessories.
4. To determine the parameters and materials necessary to carry out quality control.	4.1 Determination of dimensional, geometric and roughness controls to be performed on the part. 4.2 Proper evaluation of possible dimensional variations. 4.3 Proper choice of control points in process sheet. 4.4 Proper choice of testing tools. 4.5 Accurate and thoroughly dimensioned sketch of testing jigs and fixtures.
5. To produce the shop drawings.	5.1 Proper adaptation of detail drawings. 5.2 Proper choice of views of the part. 5.3 Precise, complete drawings, observing standards and practices. 5.4 Proper archiving of drawings.

CODE : 0134	
6. To write the process sheet.	6.1 Structured, accurate document. 6.2 Complete, precise information, free from spelling errors. 6.3 Recording of all relevant information related to the risks inherent in the use of the materials and tools. 6.4 Designation of recipients of process sheet. 6.5 Proper archiving of documents.

CODE : 0135

HARMONIZATION

This competency is equivalent to Module 8 of ***Numerical Control Machine Tool Operation*** (AVS). The content of competencies 012W, 0133 and 0135 of the present program corresponds to competency 011Z of ***Aircraft Manufacturing Technology*** (DEC).

OBJECTIF	STANDARD
Statement of the Competency To do automatic programming.	**Achievement Context** • Given: - drawings of parts to be machined, requiring automatic programming in international and imperial units of measurement; - process sheets; - instructions. • For geometric surfaces of average complexity requiring at least the programming of two-axis lathe machines and two-and-a-half-axis milling machines. • Using : - a microcomputer and software for computer-assisted manufacturing (CAD/CAM), or a machine tool controller and an interactive programming language; - a scientific calculator. • Using various reference materials, such as: - *The Machinery's Handbook*; - tables and nomographs; - technical manuals; - tool catalogues; - programming manuals. • Following occupational health and safety rules.
Elements of the Competency 1. To identify, in the drawings, process sheet and manuals, the information needed for the task.	**Performance Criteria** 1.1 Thorough identification of data needed for the task. 1.2 Accurate interpretation of information. 1.3 Accurate identification of reference surfaces. 1.4 Accurate English and French terminology.

CODE : 0135	
2. To determine the geometric elements needed to machine a part.	2.1 Proper choice of zero point. 2.2 Accurate calculation of cartesian and polar coordinates for a construction involving geometric elements. 2.3 Proper use of the software commands of geometric construction. 2.4 Precise determination of position of beginning and end of toolpath. 2.5 Conformity of representation of the geometry of the part with the requirements of the drawing. 2.6 Simplified representation of support, joining and clamping elements. 2.7 Saving of geometry. 2.8 Proper use of computerized equipment.
3. To import the drawing of a part to the screen.	3.1 Proper choice of zero point. 3.2 Proper use of the software commands of geometric construction. 3.3 Precise determination of position of beginning and end of toolpath. 3.4 Simplified representation of support, joining and clamping elements. 3.5 Saving of geometry. 3.6 Proper use of computerized equipment. 3.7 Observance of importing technique.
4. To determine the toolpaths needed to machine a part.	4.1 Complete entering of characteristics of cutting tools. 4.2 Accurate determination of toolpath for each operation. 4.3 Proper use of commands to enter data. 4.4 Accurate entering of machining parameters and data related to tools. 4.5 Conformity with process sheet. 4.6 Detailed simulation of toolpaths. 4.7 Accurate detection of programming errors. 4.8 Appropriate corrections made. 4.9 Proper saving of: - list of tool characteristics; - toolpaths.

CODE : 0135	
5. To translate the program into computer code.	5.1 Proper choice of postprocessor, in accordance with the machine tool controller. 5.2 Accurate translation of toolpaths into computer code. 5.3 Observance of sequence of operations. 5.4 Thorough verification of inclusion and correctness of program data using a text editor. 5.5 Detailed simulation of the computer coded program. 5.6 Appropriate corrections made.
6. To transfer the program to the machine tool.	6.1 Thorough application of transfer of data to the machine tool. 6.2 Conformity of transferred data to machine tool with the program. 6.3 Observance of archiving method: - saving data; - printing documents. 6.4 Observance of time limits.

CODE : 0136

OBJECTIF	STANDARD
Statement of the Competency To produce the tools necessary to carry out a manufacturing project.	**Achievement Context** • Individually and in teams. • Manufacturing simple tools that meet the needs of a medium production run, such as work-holding accessories, cutting tools, templates and punch and die tools. • Given: - shop drawings, tool drawings and sketches; - manufacturing project process sheets; - appropriate machine tools, including grinding machines or electro-discharge machines (EDM); - operation manuals; - parts catalogues and reference manuals in English and French.
Elements of the Competency	**Performance Criteria**
1. To identify the data in the drawings and basic documents.	1.1 Accurate interpretation of the drawings of the part to be manufactured, as well as tool drawings. 1.2 Accurate determination of the machines' capacities and limitations. 1.3 Accurate interpretation of dimensional and geometric measurements of tool drawings.
2. To plan the tool manufacturing.	2.1 Observance of the sequence of operations to manufacture the various parts. 2.2 Proper choice of steel type for the tools. 2.3 Proper choice of heat treatments to be applied to tool parts. 2.4 Complete and precise tool process sheet. 2.5 Accurate use of tables in estimating costs and time involved in manufacturing tools.
3. To manufacture the tools.	3.1 Proper choice of machine tools to produce the parts. 3.2 Meticulous adjustment of machine tools. 3.3 Manufacture and finishing through meticulous grinding and assembly of parts. 3.4 Thorough application of heat treatments. 3.5 Clear instructions for tool adjustment and maintenance.

CODE : 0136	
4. To carry out tests.	4.1 Meticulous, safe installation of tools in the work station. 4.2 Precise adjustment of components related to use of the tool. 4.3 Methodical, safe testing of tools.
5. To verify the work.	5.1 Methodical, meticulous evaluation of malfunctions in accordance with results. 5.2 Relevant recommendations concerning: - corrections to be made; - optimization of production. 5.3 Detailed and meticulously written inspection report.

CODE : 0137

OBJECTIF	STANDARD
Statement of the Competency To plan the maintenance of a machine population.	**Achievement Context** • Modifying a maintenance routine following the purchase of a new machine. • Given: - operation manuals; - technical drawings, primary sketches, machine maintenance manuals; - computerized control sheets and work orders; - time and cost estimate tables; - maintenance software.
Elements of the Competency	**Performance Criteria**
1. To interpret the technical documentation.	1.1 Complete recording of machine maintenance specifications. 1.2 Review of breakdown logs. 1.3 Accurate interpretation of statistics related to the efficiency and frequency of use of the machines. 1.4 Accurate interpretation of sketches and drawings.
2. To prepare routine maintenance of the machines.	2.1 Proper choice of type of programs to be set up: preventive, corrective and predictive maintenance. 2.2 Thorough planning of testing and tasks to be carried out for each machine. 2.3 Determination of timing and frequency for appropriate control checks. 2.4 Meticulous sequencing of tests and maintenance tasks. 2.5 Proper justification for choices made, in accordance with quality of the parts to be manufactured, level of reliability of the machines, and safety. 2.6 Computerized control documents correctly adapted and duly completed. 2.7 Efficient use of maintenance software.

CODE : 0137	
3. To estimate the mechanics' workload.	3.1 Estimation of the number of hours required according to tables. 3.2 Organization of a maintenance schedule in accordance with availability of resources. 3.3 Computerized work orders correctly adapted, complete and clear.
4. To organize maintenance tasks.	4.1 Proper choice of diagnostic techniques according to the maintenance situation. 4.2 Proper choice of maintenance tools. 4.3 Meticulous organization of maintenance work areas. 4.4 Proper planning of maintenance program follow-up.

CODE : 0138

OBJECTIF	STANDARD
Statement of the Competency To maintain manufacturing machines.	**Achievement Context** • Using a maintenance plan. • Given : - operation manuals; - technical drawings and machine maintenance manuals; - computerized control sheets and work orders; - mechanical parts catalogues; - maintenance software; - WHMIS index cards; - appropriate measurement instruments and maintenance tools; - machine tools.
Elements of the Competency	**Performance Criteria**
1. To interpret the technical documentation.	1.1 Accurate interpretation of the machine's technical manuals. 1.2 Interpretation of control sheets. 1.3 Interpretation of work order.
2. To verify the condition of the machine.	2.1 Accurate determination of the risks inherent in the maintenance and handling of hazardous materials. 2.2 Proper choice of testing instruments. 2.3 Conformity of diagnostic method with the situation given. 2.4 Detailed recording of functioning parameters and signs of defects. 2.5 Accurate determination of causes of defects. 2.6 Detailed evaluation of the state of components. 2.7 Accurate diagnostic technique. 2.8 Proper choice of corrective measures.

CODE : 0138	
3. To perform maintenance tasks.	3.1 Proper choice of maintenance method. 3.2 Proper choice of tools and apparatus. 3.3 Careful disassembly and reassembly of equipment, fasteners and components. 3.4 Proper lubrication of machine components. 3.5 Observance of proper and safe maintenance techniques. 3.6 Proper choice of self-protective measures. 3.7 Proper, precise adjustments and corrections made. 3.8 Observance of maintenance plan.
4. To verify the proper running of the machine.	4.1 Safe testing of the machine. 4.2 Meticulous verification of operational parameters. 4.3 Work order duly completed. 4.4 Meticulous updating of computerized work order.

CODE : 0139	
OBJECTIF	STANDARD
Statement of the Competency To organize the work for a medium production run.	**Achievement Context** • Multidisciplinary teamwork. • For continuous or batch production. • Using drawings, specifications, estimates, process sheets and the master production schedule. • Given : – planning software applications; – catalogues, graphics and relevant technical documentation. – Following occupational health and safety rules and standards.
Elements of the Competency	**Performance Criteria**
1. To analyze the documents related to the project.	1.1 Accurate interpretation of all the documentation. 1.2 Summary of the information contained in the master production schedule, including work organization. 1.3 Accurate recording of production subassemblies and the necessary manufacturing procedures.
2. To estimate the resources required to create the project.	2.1 Accurate evaluation of the necessary materials and equipment. 2.2 Realistic estimate of time limits. 2.3 Accurate determination of the number of work stations needed. 2.4 Proper use of tables to determine the number of machine- and person-hours needed. 2.5 Accurate determination of needs exceeding normal production capacity. 2.6 Relevant and persuasive recommendations related to use of resources.

CODE : 0139	
3. To establish the steps in the production process and traffic flow of the materials.	3.1 Optimum planning of the steps and operations involved in production. 3.2 Optimum planning of the safe layout of the manufacturing machines, in accordance with the manufacturing process and work organization. 3.3 Proper planning for the safe use of lifting and handling equipment. 3.4 Detailed sketch of implementation plan. 3.5 Functional, safe, ergonomic organization of work stations, and lifting and handling equipment. 3.6 Realistic estimate of routing of parts. 3.7 Need to protect the products in setting up storage stations. 3.8 Proper use of a planning software application.
4. To organize quality control.	4.1 Detailed recording of the critical points in production to be verified and tested. 4.2 Optimum observance of verification sequences and lot sampling. 4.3 Meticulous, safe organization of control stations.
5. To verify the quality of the planning related to work organization.	5.1 Detailed verification of routing among manufacturing, handling and quality control check points. 5.2 Relevant recommendations tactfully put to team members concerning corrections to be made. 5.3 Openness to comments and suggestions. 5.4 Accurate planning of follow-ups.

CODE : 013A	
OBJECTIF	STANDARD
Statement of the Competency To coordinate a medium production run.	**Achievement Context** • Multidisciplinary teamwork. • For a medium production run of mechanisms comprising: – special assemblies; – complex geometrically shaped parts; – varied materials. • Using drawings, specifications, estimates, process sheets, routing among manufacturing, handling and quality control check points. • Given: – reference manuals, catalogues, standards, tables, graphs and nomographs; – conventional, automatic and numerical control machine tools. • Following occupational health and safety rules and standards. • In accordance with the new types of work organization.
Elements of the Competency	**Performance Criteria**
1. To plan the work.	1.1 Thorough analysis of all relevant documentation. 1.2 Accurate interpretation of drawings. 1.3 Equitable division of tasks, according to respective competencies of team members. 1.4 Accurate interpretation of the master production schedule.
2. To estimate the scope of the work.	2.1 Accurate estimate of material resources needed. 2.2 Logical organization of manufacturing, handling and quality control circuits. 2.3 Accurate estimate of human resources needed. 2.4 Accurate estimate of machine running time on the basis of tables and nomographs.
3. To organize the manufacture of the product.	3.1 Detailed, safe organization of manufacturing work stations. 3.2 Detailed, safe organization of quality control work stations. 3.3 Detailed, safe organization of handling work stations. 3.4 Detailed organization of follow-up of work orders.

CODE : 013A	
4. To launch production.	4.1 Methodical training of personnel for the tasks. 4.2 Detailed explanation of health and safety rules. 4.3 Detailed, safe preparation of each work station, involving manufacturing, handling and quality control. 4.4 Safe running and handling of machine tools. 4.5 Meticulous verification of each manufacturing operation during the production of the first-off parts. 4.6 Meticulous control of critical operations. 4.7 Relevant preventive and corrective steps taken. 4.8 Observance of procedure and safety rules for testing. 4.9 Corrections related to quality control and testing meticulously recorded in the technical documentation.
5. To supervise the manufacturing operation.	5.1 Accurate interpretation of control documents. 5.2 Control checks and sound judgment with regard to: - the quality of manufactured parts; - their assembly; - the characteristics of the materials; - conformity with specifications. 5.3 Meticulous updating of production schedules. 5.4 Sound application of techniques for supervising personnel. 5.5 Thorough analysis of manufacturing methods. 5.6 Proper choice of means to optimize methods and work stations. 5.7 Relevance of corrections adopted with regard to production problems. 5.8 Proper choice of problem-solving strategies, according to each situation.

CODE : 013B

HARMONIZATION
This competency is equivalent to Module 16 of ***Industrial Drafting*** (DVS).

OBJECTIF	STANDARD
Statement of the Competency To produce flat pattern layouts.	**Achievement Context** • Creating conventional and computerized drawings. • Developing industrial mechanical parts. • Using a detail drawing in English and French, as well as corresponding data. • Given: – a computerized work station, with a plotter; – drawing or development software.
Elements of the Competency	**Performance Criteria**
1. To organize the work.	1.1 Accurate interpretation of preliminary drawing and corresponding data. 1.2 Accurate, proportional representation of the part in sketch form. 1.3 Proper preparation of materials and work station.
2. To draw an orthographic projection of the object, using conventional methods.	2.1 Proper layout of views. 2.2 Conformity of drawing with data. 2.3 Respect of dimensions. 2.4 Clean, accurate lines.
3. To draw the intersection of the parts.	3.1 Respect of method of construction used to determine the intersection of the lines. 3.2 Accurate designation of lines. 3.3 Accurate positioning and length of construction lines. 3.4 Conformity of drawing with construction lines.
4. To project construction lines.	4.1 Respect of chosen construction method to determine the development contours of parts. 4.2 Accurate calculations. 4.3 Accurate determination of supplementary lengths allowed for folding thick materials. 4.4 Accurate designation of lines of various constructions. 4.5 Accurate positioning and length of construction lines.

CODE : 013B	
5. To draw the development contour.	5.1 Conformity of contour line with construction lines. 5.2 Accurate designation of points demarcating the lines. 5.3 Accurate representation of the part's joining methods. 5.4 Meticulous work.
6. To write in dimensioning and complementary information.	6.1 Exact dimensions following set standards. 6.2 Accuracy of notation and information recorded on the title block.
7. To produce a drawing using a development software application.	7.1 Accurate determination of the layout of the parts on the raw material to ensure optimum use of materials during the cutting process. 7.2 Accuracy of data entered in the software application. 7.3 Proper use of application's basic functions. 7.4 Exact dimensions and information recorded on the drawing. 7.5 Determination of parameters for printing with a plotter.
8. To verify the drawing.	8.1 Observance of procedure for verifying and approving correctness of drawing. 8.2 Conformity of drawing with data. 8.3 Verification model accurately produced. 8.4 Conformity of model with data.
9. To archive the documents.	9.1 Efficient management of documents. 9.2 Proper choice of archiving method.

CODE : 013C

HARMONIZATION
This competency is equivalent to Module 11 of ***Industrial Drafting*** (DVS).

OBJECTIF	STANDARD
Statement of the Competency To use the specialized functions of a computer-aided drafting (CAD) program.	**Achievement Context** • Using a computerized work station. • Given: – a CAD program; – a plotter; – relevant technical documentation.
Elements of the Competency	**Performance Criteria**
1. To personalize the graphic environment of a CAD program.	1.1 Proper adaptation of pull-down menus, toolbars and keyboard. 1.2 Efficient use of relevant functions.
2. To control the display of items on the screen.	2.1 Proper determination of parameters. 2.2 Justification of chosen parameters. 2.3 Efficient use of advanced commands of CAD software.
3. To modify dimensioning styles and variables.	3.1 Proper determination of dimensioning parameters. 3.2 Conformity of dimensioning styles with industrial drafting norms. 3.3 Proper application of dimensioning techniques of different variables.
4. To use a library of drawings.	4.1 Structured grouping of drawings to create a library. 4.2 Proper modification of an existing block. 4.3 Observance of procedure for saving a block in an independent folder (using, for example, the *Wblock* command). 4.4 Insertion of a drawing as a reference folder (using, for example, the *Xref* command). 4.5 Optimum use of commands for creating, modifying and exporting attributes of existing blocks.
5. To represent hatching lines on the drawing of a section comprising several materials.	5.1 Optimum use of commands. 5.2 Observance of drawing conventions and standards for representing materials.

CODE : 013C	
6. To insert a table or text in a drawing.	6.1 Observance of procedure for inserting tables created in other applications, such as a word processor or a spreadsheet. 6.2 Optimum use of commands for: - writing texts; - creating paragraphs; - creating lettering styles; - modifying texts; - inserting symbols.
7. To manage files for a CAD program.	7.1 Proper identification of file extensions. 7.2 Observance of procedure for: - file locking; - transferring files from one application or user to another.
8. To create three-dimensional shapes (3D) in wire-frame and surface modeling.	8.1 Accurate differentiation among the various 3D methods of construction. 8.2 Proper choice of coordinates to construct parts with, for example, the UCS (User Coordinate System) command. 8.3 Optimum use of commands for creating basic surfacing plans. 8.4 Proper choice of commands for viewing the parts created.

CODE : 013D

HARMONIZATION
This competency is equivalent to Module 17 of ***Industrial Drafting*** (DVS).

OBJECTIF	STANDARD
Statement of the Competency To make a three-dimensional model of an object.	**Achievement Context** • For the volume modeling of an object. • For an object comprising an assembly of parts. • Given an orthographic projection of a drawing or sketch. • Using a modeling software application.
Elements of the Competency	**Performance Criteria**
1. To plan the work.	1.1 Proper choice of method: - basic two-dimensional shapes; - three-dimensional primary solids. 1.2 Proper planning of sequence of operations for constructing the three-dimensional object. 1.3 Relevant modifications made to the variables of the layers. 1.4 Proper proportions respected in sketches.
2. To create the parts of the object.	2.1 Proper fragmentation of drawing to determine shapes. 2.2 Accurate extrusion of irregular shapes. 2.3 Optimum use of commands for combining and subtracting. 2.4 Relevant modifications of existing shapes: - fillets; - rounds; - chamfers. 2.5 Proper choice of commands for modeling.
3. To assemble the parts of the object.	3.1 Proper insertion of reference files and blocks to create an exploded view. 3.2 Respect of reference points when inserting.
4. To do the layout.	4.1 Proper layout of drawings on the sheet. 4.2 Proper choice of views and sections. 4.3 Proper control of visibility of layers in the views. 4.4 Accurate recording of dimensions on drawings. 4.5 Proper control of visibility and density of mesh generation.

CODE : 013D	
5. To present and print a rendering.	5.1 Proper choice of view-point. 5.2 Appropriate choice of materials and colour. 5.3 Proper choice of lights, such as point, distant, spot or ambient light. 5.4 Accurate determination of parameters for adding definition to the image. 5.5 Proper determination of file extension. 5.6 Observance of procedure for printing.
6. To animate objects on screen.	6.1 Proper choice of commands for creating and viewing slides. 6.2 Proper organization of folders for automatic slide presentation.

CODE : 013E	
OBJECTIF	STANDARD
Statement of the Competency To develop hydraulic and pneumatic circuits for industrial machines.	**Achievement Context** • In teams. • Designing simple hydraulic and pneumatic circuits. • Using sketches, technical drawings and data from specifications. • Given: – catalogues and technical documentation, in English and French; – a test stand.
Elements of the Competency	**Performance Criteria**
1. To analyze the specifications and the technical documentation.	1.1 Accurate identification of types of required hydraulic and pneumatic circuits, their functions and characteristics. 1.2 Recording of relevant information, such as cycle time and expected performance criteria. 1.3 Accurate identification of expectations and constraints related to the need.
2. To establish circuits' operating conditions.	2.1 Accurate calculation of forces involved and of operating parameters for the operations of each circuit. 2.2 Accurate determination of basic movements and operations for each circuit.
3. To develop basic hydraulic circuits.	3.1 Proper sequence of operations for the cycle of the hydraulic circuit. 3.2 Proper choice of simple or combined hydraulic circuit, as well as its components, such as filters, pumps and valves to control pressure, direction and flow. 3.3 Due attention given to maintenance of circuit's components. 3.4 Choice of relevant safety devices. 3.5 Proper selection made from catalogues of hydraulic components. 3.6 Complete schematic of circuit.

CODE : 013E	
4. To develop basic pneumatic circuits.	4.1 Proper sequence of operations for the cycle of the pneumatic circuit. 4.2 Proper choice of circuit type: - supply of compressed air; - flow control valve; - pressure valve; - combined circuits. 4.3 Proper choice of safety devices. 4.4 Proper selection made from catalogues of pneumatic components. 4.5 Due attention given to maintenance of circuit components. 4.6 Complete schematic of circuit.
5. To perform tests.	5.1 Meticulous assembly of circuits on the test stand. 5.2 Accurate detection of operational errors in circuits. 5.3 Proper corrections made to each circuit. 5.4 Accurate, meticulous recording of results in report.

CODE : 013F

OBJECTIF	STANDARD
Statement of the Competency To do the engineering design of an industrial piping system.	**Achievement Context** • Designing a system comprising at least the pipe work, a pump, an electric motor, and valves and fittings. • Using the sketch of various components, data and specifications. • Given: – time estimate tables; – a computerized work station connected to the information highway; – relevant software, including an electronic library; – relevant technical documentation in English and French.
Elements of the Competency	**Performance Criteria**
1. To analyze specifications and drawings.	1.1 Accurate identification of expectations and constraints related to the project. 1.2 Accurate identification of elements of the industrial context to be taken into account. 1.3 Accurate recording of required performance criteria. 1.4 Accurate determination of constraints to which components are submitted.
2. To plan the design.	2.1 Due consideration given to problem-solving strategies. 2.2 Realistic estimate of tasks to be performed and time limits. 2.3 Efficient search for commercially available components. 2.4 Structured archiving of data. 2.5 Realistic estimate of the time required to complete the design, using tables. 2.6 Accurate recording of measurements.

CODE : 013F	
3. To establish operating conditions of components.	3.1 Accurate calculation of flow and pressure of system. 3.2 Accurate determination of the power required for the pump and motor. 3.3 Due consideration given to mechanical constraints, corrosion conditions, temperature and other data related to the project.
4. To develop the initial design of the piping system and its components.	4.1 Proper choice of materials. 4.2 Proper choice of piping and its components, in accordance with operating conditions. 4.3 Accurate interpretation of tables and nomographs. 4.4 Accurate representation of relevant solutions, in sketch form. 4.5 Objective evaluation of the feasibility of the possible solutions, in accordance with data given.
5. To illustrate the system by means of sketches and drawings.	5.1 Observance of ergonomic guidelines in preparing the work station. 5.2 Proper choice of types of drawings. 5.3 Observance of procedure for importing computerized data and drawings. 5.4 Accurate representation of system, using orthographic and isometric projections. 5.5 Accuracy of linear tolerances and layout of parts. 5.6 Complete list of materials and cost involved. 5.7 Complete, representative drawings, conforming to standards and norms. 5.8 Observance of time limits.
6. To verify the quality of the design.	6.1 Conformity of drawings with data given, as well as with standards and norms. 6.2 Conformity of design with safety standards. 6.3 Accurate corrections made.

CODE : 013F	
7. To present the proposal.	7.1 Rational explanation of operations involved in designing the project. 7.2 Clear, concise presentation of drawings illustrating the project. 7.3 Relevant and persuasive justification of choices related to designing the project. 7.4 Conformity of designed object with initial expectations and constraints. 7.5 Openness to comments. 7.6 Quality and relevance of adaptations made.

CODE : 013G

OBJECTIF	STANDARD
Statement of the Competency To do the engineering design of an industrial work process system.	**Achievement Context** • In teams. • Designing industrial power transmission systems. • For complex systems, such as work stations, sorters and conveyors. • Using a drawing of the system and specifications. • Given: – a computerized work station connected to the information highway; – relevant software, including an electronic library; – relevant technical documentation in English and French.
Elements of the Competency	**Performance Criteria**
1. To analyze the technical documentation related to the design project.	1.1 Accurate identification of the type of industrial system needed, its functions and characteristics. 1.2 Realistic identification of expected performance criteria. 1.3 Accurate identification of expectations and constraints related to need. 1.4 Accurate determination of the technological function of the system. 1.5 Relevant recording of elements of the industrial context to be taken into account.
2. To plan the work.	2.1 Due consideration given to problem-solving strategies. 2.2 Realistic estimate of time limits. 2.3 Complete, accurate recording of measurements. 2.4 Efficient search for commercially available components.

CODE : 013G	
3. To record the operating conditions of the system.	3.1 Relevant, accurate calculations of power, loads, rotational speed and tolerances. 3.2 Due consideration given to application conditions, required performances and other data related to the project. 3.3 Accurate interpretation of tables and nomographs. 3.4 Complete analysis of simple mechanical connections of the system. 3.5 Relevant analysis of the kinematic chain, if needed.
4. To develop the initial design.	4.1 Active participation in a brainstorming session. 4.2 Proper choice of materials. 4.3 Proper choice of components and safety devices, in accordance with operating conditions. 4.4 Objective evaluation of the technological and economic feasibility of the possible solutions, according to need. 4.5 Accurate representation of the relevant solution in sketch form. 4.6 Clear, written maintenance instructions. 4.7 Rough estimate of designing costs, using tables. 4.8 Information and modifications tactfully submitted to team members at the appropriate time.
5. To validate the design with the relevant parties.	5.1 Clear, persuasive presentation of design, using relevant drawings and documents. 5.2 Openness to comments. 5.3 Quality and relevance of adaptations.
6. To do the technical drawings of the system.	6.1 Proper choice of required drawing types. 6.2 Clear, meaningful representation of the system. 6.3 Accuracy of tolerances and layout of parts. 6.4 Precise, complete data for manufacturing the system. 6.5 Complete list of materials and cost involved. 6.6 Observance of drawing standards and conventions. 6.7 Conformity of designed system with given data. 6.8 Observance of time limits.

CODE : 013G	
7. To present the proposal.	7.1 Meticulous, complete recording of data. 7.2 Rational explanation of operations involved in designing the system. 7.3 Clear, concise presentation of drawings illustrating the project: sketches, assembly and detail drawings, and three-dimensional drawing. 7.4 Relevant, persuasive justification of choices related to designing the project. 7.5 Conformity of designed object with initial expectations and constraints. 7.6 Openness to comments. 7.7 Quality and relevance of adaptations made.

CODE : 013H

OBJECTIF	STANDARD
Statement of the Competency To do the engineering design of machine housings.	**Achievement Context** • Designing the structures and supports for simple industrial machine housings. • Using sketches of various components and data given in the specifications. • Given: – a computerized work station connected to the information highway; – relevant software, including an electronic library; – relevant technical documentation in English and French; – relevant measurement instruments.
Elements of the Competency	**Performance Criteria**
1. To plan the work.	1.1 Thorough analysis of specifications and technical documentation of the project. 1.2 Accurate determination of expectations and constraints related to need. 1.3 Accurate recording of general parameters of the project. 1.4 Realistic determination of work plan and time limits.
2. To take measurements.	2.1 Verification of conformity of measurements taken with data given in the specifications. 2.2 Complete recording of data. 2.3 Accurate determination of health and safety rules, when visiting a work site.
3. To determine the admissible loads for the structure.	3.1 Accurate determination of the characteristics of the structures to be respected and the forces exerted. 3.2 Accurate calculation of conditions of equilibrium, keeping in mind the principles of physics. 3.3 Accurate calculation of resistance, rigidity and stability of frames.

CODE : 013H	
4. To choose the materials of the structure.	4.1 Due consideration given to all defined parameters. 4.2 Proper choice of materials, according to the existing classification.
5. To choose the material cross sections from references.	5.1 Accurate differentiation of existing sections. 5.2 Accurate determination of application conditions of sections. 5.3 Logical choice of sections.
6. To choose the fastening method of the sections.	6.1 Accurate determination of the forces exerted on the fasteners. 6.2 Accurate calculation of resistance, rigidity and stability of fasteners. 6.3 Accurate determination of admissible loads for the fasteners. 6.4 Logical choice of fastening method.
7. To do the technical drawings.	7.1 Proper choice of drawing types. 7.2 Clear, meaningful presentation of the structure and its components. 7.3 Accuracy of tolerances and layout of parts. 7.4 Observance of drawing standards. 7.5 Observance of time limits. 7.6 Conformity of designed object with initial expectations and constraints.
8. To present the proposal.	8.1 Rational explanation of operations involved in designing the project. 8.2 Clear, concise presentation of drawing illustrating the project: sketches, assembly and detail drawings, and installation drawing. 8.3 Relevant and persuasive justification of choices related to designing the structure. 8.4 Openness to comments.

CODE : 013J

OBJECTIF	STANDARD
Statement of the Competency To develop basic automated circuits.	**Achievement Context** • For industrial applications. • For hydraulic and pneumatic circuits. • Using specifications and technical drawings. • Given: – a computerized work station connected to the information highway; – a test stand; – relevant software; – relevant industrial documentation in English and French.
Elements of the Competency	**Performance Criteria**
1. To develop combinational logic circuits.	1.1 Thorough analysis of the problem. 1.2 Accurate identification of types of circuits needed, their function, characteristics, operational capacities and limitations. 1.3 Observance of sequence of automation operations. 1.4 Relevant sketch of operations to be performed. 1.5 Proper choice of logic cells, as needed. 1.6 Observance of procedure for verifying the circuit on a test stand. 1.7 Meticulous presentation of results in a report.
2. To develop sequential logic circuits.	2.1 Thorough analysis of the problem. 2.2 Accurate identification of types of circuits needed, their function, characteristics, operational capacities and limitations. 2.3 Observance of sequence of automation operations. 2.4 Relevant sketch of operations to be performed. 2.5 Proper choice of sequencers and logic cells, as needed. 2.6 Observance of procedure for verifying the circuit on a test stand. 2.7 Meticulous presentation of results in a report.

CODE : 013J	
3. To control simple circuits using programmable logic controllers (PLC).	3.1 Accurate determination of expected performances and possibilities of the PLC. 3.2 Methodical sketching of the structure of the automation process. 3.3 Accurate interpretation of simple automation sketches and technical documentation diagrams. 3.4 Proper choice of components and devices, according to the requirements of the given circuit. 3.5 Thorough planning in setting up simple automated circuits. 3.6 Proper programming of the PLC. 3.7 Detailed inspection of the parameters of circuit cycles. 3.8 Observance of procedure for verifying the circuit on a test stand. 3.9 Meticulous presentation of results in a report.
4. To program a sequence of simple operations controlled by a robot.	4.1 Identification of the basic structure of industrial robots. 4.2 Accurate determination of expected performances and possibilities of the robot. 4.3 Functional definition of the new work cycle, as required in the specifications. 4.4 Proper adaptation of programming, in accordance with the new data. 4.5 Thorough inspection of programming parameters. 4.6 Observance of procedure for dry runs related to the work cycle. 4.7 Appropriate corrections made to work cycle errors. 4.8 Meticulous presentation of results in a report.

CODE : 013K	
OBJECTIF	STANDARD
Statement of the Competency To automate an industrial system.	**Achievement Context** • In teams. • For a work station or a simple machine. • Given: – specifications; – sketches and technical drawings; – a computerized work station connected to the information highway; – relevant software; – relevant technical documentation in English and French.
Elements of the Competency	**Performance Criteria**
1. To analyze the specifications and the documentation related to the project.	1.1 Accurate determination of expectations and constraints related to automating a system. 1.2 Accurate identification of the general parameters of the system to be automated. 1.3 Accurate identification of the hydraulic, pneumatic and electric circuits needed. 1.4 Accurate identification of possibilities and limitations related to automating the system and its circuits. 1.5 Proper identification of expected performance criteria. 1.6 Accurate definition of problems to be solved.
2. To plan the work.	2.1 Realistic estimate of time limits. 2.2 Due consideration given to problem-solving strategies.
3. To establish the operating conditions and parameters of the system to be automated.	3.1 Accurate calculations of loads, power and rotational speeds of components. 3.2 Accurate determination of technological function of the system. 3.3 Thorough analysis of operating phases of the system. 3.4 Accurate determination of appropriate start-up procedures and safety stops. 3.5 Set-up of sequence of operations of the work cycle, keeping in mind the safety rules for an automated system. 3.6 Complete sketching of work cycle.

CODE : 013K	
4. To choose the technology best adapted to the system.	4.1 Accurate interpretation of electric and electronic sketches related to the circuits to be automated. 4.2 Accurate determination of the possibilities and limitations inherent in automation technologies: - electro-hydraulic interlocking systems; - programmable logic controllers; - robots; - all other technology. 4.3 Relevance of the technology selected.
5. To present the automation project to the relevant parties.	5.1 Logical explanation of automation technique. 5.2 Justification of choices. 5.3 Conformity of automation project with initial expectations. 5.4 Openness to comments. 5.5 Relevant recommendations regarding corrections to be made.
6. To program the work cycle.	6.1 Proper choice of programming language in accordance with the technology selected. 6.2 Accurate translation of work cycle operations into program language. 6.3 Observance of sequence of operations. 6.4 Meticulous verification of the presence and accuracy of the program data, using a text editor. 6.5 Detailed simulation of program. 6.6 Corrections made, if needed.
7. To verify the safety of the automated system.	7.1 Conformity of safety devices with work environment requirements. 7.2 Corrections made to program.
8. To archive data.	8.1 Detailed, methodical archiving of computerized data. 8.2 Reports duly completed.

CODE : 013L

OBJECTIF	STANDARD
Statement of the Competency To coordinate a design project.	**Achievement Context** • In teams. • Modifying a design project for an existing system. • For a mechanical system integrating various types of circuits, such as hydraulic, pneumatic, electric and automated. • Given: – a computerized work station connected to the information highway; – relevant software, including an electronic library; – relevant technical documentation in English and French. • In a context characterized by the integration of new workplace methods.
Elements of the Competency	**Performance Criteria**
1. To analyze the project's specifications and technical documentation.	1.1 Accurate interpretation of drawings and technical information. 1.2 Accurate interpretation of electric and electronic diagrams. 1.3 Accurate determination of expectations and constraints related to the modifications to be made to the system. 1.4 Accurate identification of general parameters of the system. 1.5 Accurate determination of the technological function of the system and its components.
2. To verify the feasibility of the project.	2.1 Accurate estimate of available resources. 2.2 Realistic estimate of costs involved in carrying out the project, given existing data related to designing and manufacturing time, as well as the cost of materials. 2.3 Persuasive presentation of feasibility study to the relevant parties. 2.4 Openness to comments.

CODE : 013L	
3. To plan the work.	3.1 Accurate determination of work plan and time limits. 3.2 Equitable division of tasks, according to respective competencies of team members. 3.3 Accurate determination of physical, mechanical, economic and other constraints. 3.4 Identification of operating characteristics related to the system to be modified. 3.5 Accuracy of calculations needed for designing the project.
4. To verify the quality of the modifications made to the system.	4.1 Proper choice of materials. 4.2 Proper choice of material treatments. 4.3 Optimum, safe solutions. 4.4 Detailed preliminary sketches. 4.5 Complete list of materials. 4.6 Proper adjustments made to estimated costs. 4.7 Validation of the quality of the design by a superior. 4.8 Objective, persuasive presentation of proposals to the relevant parties. 4.9 Corrections made.
5. To verify the quality of the design drawings.	5.1 Accurate, thorough updating of existing drawings. 5.2 Proper choice of drawing types. 5.3 Clear, meaningful representation of modifications made to the system. 5.4 Accuracy of tolerances and alignment of parts. 5.5 Methodical, thorough verification of the conformity of drawings with project's initial data and standards.

CODE : 013L	
6. To write out an estimate.	6.1 Relevance of information gathered. 6.2 Precise, complete information concerning objectives, tasks to be performed, cost involved, as well as materials to be purchased. 6.3 Clear, written document, stating selection criteria for tenders. 6.4 Meticulous, well-structured document. 6.5 Appropriate modifications made to the technical estimate, after its presentation to the relevant parties. 6.6 Validation of the estimate by a superior.
7. To process tenders.	7.1 Clearly written call for tenders. 7.2 Thorough analysis of tenders. 7.3 Objective choice made in accordance with the criteria set out in the estimate.
8. To supervise the operations involved in the designing work.	8.1 Strict observance of time limits. 8.2 Application of appropriate supervising techniques. 8.3 Sound proposals made regarding the optimum use of drafting software. 8.4 Information given and comments tactfully made at the appropriate time. 8.5 Verification of the conformity of designing and drawing operations with requirements. 8.6 Efficient, objective problem-solving strategies applied throughout the design project. 8.7 Accurate reports, meticulously written, in accordance with quality-assurance criteria.

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 programme 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.

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.

Éducation

Québec

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