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**MECHANICAL  
MANUFACTURING**

**MECHANICAL ENGINEERING  
TECHNOLOGY**

*Program of study*

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Sector : 11, Mechanical Manufacturing  
Diploma of college studies

Mechanical Engineering Technology  
**241.A0**



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241.A0

**Mechanical Engineering Technology**

2000

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**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

**Special conditions for admission :**

- Math 526
- Physics 534





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## INTRODUCTION TO THE PROGRAM

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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  $\frac{2}{3}$  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  $\frac{1}{3}$  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.





**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 compo

# PART ONE

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## GOALS OF THE PROGRAM

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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.

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*.<sup>1</sup>



## **THE GOALS OF GENERAL EDUCATION**

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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-

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  $\frac{2}{3}$  credits distributed as follows:

language of instruction and literature: 7  $\frac{1}{3}$  credits;  
humanities or *philosophie*: 4  $\frac{1}{3}$  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.







## LIST OF PROGRAM OBJECTIVES

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### 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 Dissserter 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)

- 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

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*Mechanical Engineering Technology* (241.A0) is a technical education program in the Mechanical Manufacturing sector. It was designed and developed as part of a project to harmonize the different programs in this sector, including *Aircraft Manufacturing Technology* at the college level, as well as *Industrial Drafting*, *Machining Techniques* and *Numerical Control Machine Tool Operation* at the secondary level.

The different programs were harmonized with a view to achieving continuity between vocational and technical education. The main objective of harmonization is to encourage students to pursue their studies by optimizing their efforts, whether they are returning to school after a period of absence or taking a new career direction. Harmonization makes it possible to move from one program to another or from one level of instruction to another without repeating the same courses.

Tables of equivalents have been designed to show the relationships among the different programs that have undergone harmonization. These tables appear on the pages that follow.

Equivalencies between programs can be of different types. Some competencies are common to several programs of study. Their content is therefore identical, and they bear the same code in all programs in a given level of instruction. Some competencies correspond to several competencies in another program or may be deemed equivalent to a competency in another program by the development team despite the fact that they are not identical. This information is illustrated in the tables. For all other cases, the educational institution is responsible for evaluating and recognizing the prior learning of its students.

The following tables concern all programs involved in the harmonization process. The left-hand column contains the codes and statements of competency of the program in question. The other columns contain the codes of the equivalent competencies in the other programs. Thus, students who have acquired one or more competencies in the program in question will receive recognition for the equivalent competencies in another program if they pursue their studies in that program.



Students who have attained one or more of the competencies of the *Mechanical Engineering Technology* (241.A0) program will receive recognition for corresponding competencies in one of the programs below, if they pursue their studies in that program.

**Table 1 – Equivalents for the *Mechanical Engineering Technology* program**

FROM		TO			
MECHANICAL ENGINEERING TECHNOLOGY (DEC) 241.A0		Industrial Drafting (DVS) 5725	Machining Techniques (DVS) 5723	Numerical Control Machine Tool Operation (AVS) 5724	Aircraft Manufacturing Technology (DEC) 280.B0
012D	Analyze the occupation				
012E	Solve problems related to industrial mechanics	872 324	872 024		011Q
012F	Interpret technical drawings	872 035	872 035		
012G	Sketch objects	872 335	872 083		
012N	Produce detail drawings	98.75 .0258 a	012G		



Students who have attained one or more of the competencies of the *Machining Techniques* (5723) program will receive recognition for corresponding competencies in one of the programs below, if they pursue their studies in that program.

**Table 2 – Equivalents for the *Machining Techniques* program**

<b>FROM</b>		<b>TO</b>			
<b>MACHINING TECHNIQUES (DVS) 5723</b>		<b>Industrial Drafting (DVS) 5725</b>	<b>Mechanical Engineering Technology (DEC) 241.A0</b>	<b>Numerical Control Machine Tool Operation (AVS) 5724</b>	<b>Aircraft Manufacturing Technology (DEC) 280.B0</b>
872 011	Determine their suitability for the trade and the training process			872 011	
872 024	Solve mathematical problems related to conventional machining				





Students who have attained one or more of the competencies of the *Industrial Drafting (5725)* program will receive recognition for corresponding competencies in one of the programs below, if they pursue their studies in that program.

**Table 3 – Equivalentents for the *Industrial Drafting* program**

FROM	TO			
<b>INDUS TRIAL DRAFTING (DVS) 5725</b>	<b>Mechanical Engineering Technology (DEC) 241.A0</b>	<b>Machining Techniques (DVS) 5723</b>	<b>Numerical Control Machine Tool Operation (AVS) 5724</b>	<b>Aircraft Manufacturing Engineering Technology 241.A0</b>







## PART TWO

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**OBJECTIVES AND STANDARDS -  
GENERAL EDUCATION COMMON TO ALL  
PROGRAMS**

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OBJECTIVE	STANDARD
<p><b>Statement of the competency</b>                      E3596 Adequ Clear pres Titio of                      To analyze and produce various forms of discourse.</p> <p><b>Elements</b></p> <p>1 To identify the characteristics and functions of the components of discourse.</p>	<p><b>Performance criteria</b></p> <p>1.1 Accurate explanation of the denotation of</p>

1.1



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

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

OBJECTIVE	STANDARD
<p><b>Statement of the competency</b></p> <p>To apply a logical analytical process to how knowledge is organized and used.</p> <p><b>Elements</b></p> <ol style="list-style-type: none"> <li>1 To recognize the basic elements of a field of knowledge.</li> <li>2 To define the modes of organization and utilization of a field of knowledge.</li> <li>3 To situate a field of knowledge within its historical context.</li> <li>4 To organize the main components into coherent patterns.</li> <li>5 To produce a synthesis of the main components.</li> </ol>	<p><b>Performance criteria</b></p> <ol style="list-style-type: none"> <li>1.1 Appropriate description of the basic elements.</li> <li>1.2 Appropriate use of terminology relevant to fields of knowledge.</li> <li>2.1 Adequate definition of the dimensions, limits, and uses of fields of knowledge.</li> <li>3.1 Accurate identification of the main components in the historical development of fields of knowledge.</li> <li>3.2 Accurate description of the effects of historical development and societal milieu on the limitations and uses of a field of knowledge.</li> <li>4.1 Coherent organization of the main components.</li> <li>5.1 Appropriate analysis of the components.</li> <li>5.2 Coherent synthesis of the main components.</li> <li>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.</li> </ol>
<p><b>LEARNING ACTIVITIES</b></p>	
<p><b>Discipline :</b> Humanities</p> <p><b>Weighting :</b> 3-1-3</p> <p><b>Credits :</b> 2 1/3</p>	

GENERAL EDUCATION COMMON TO ALL PROGRAMS : HUMANITIES CODE : 000G

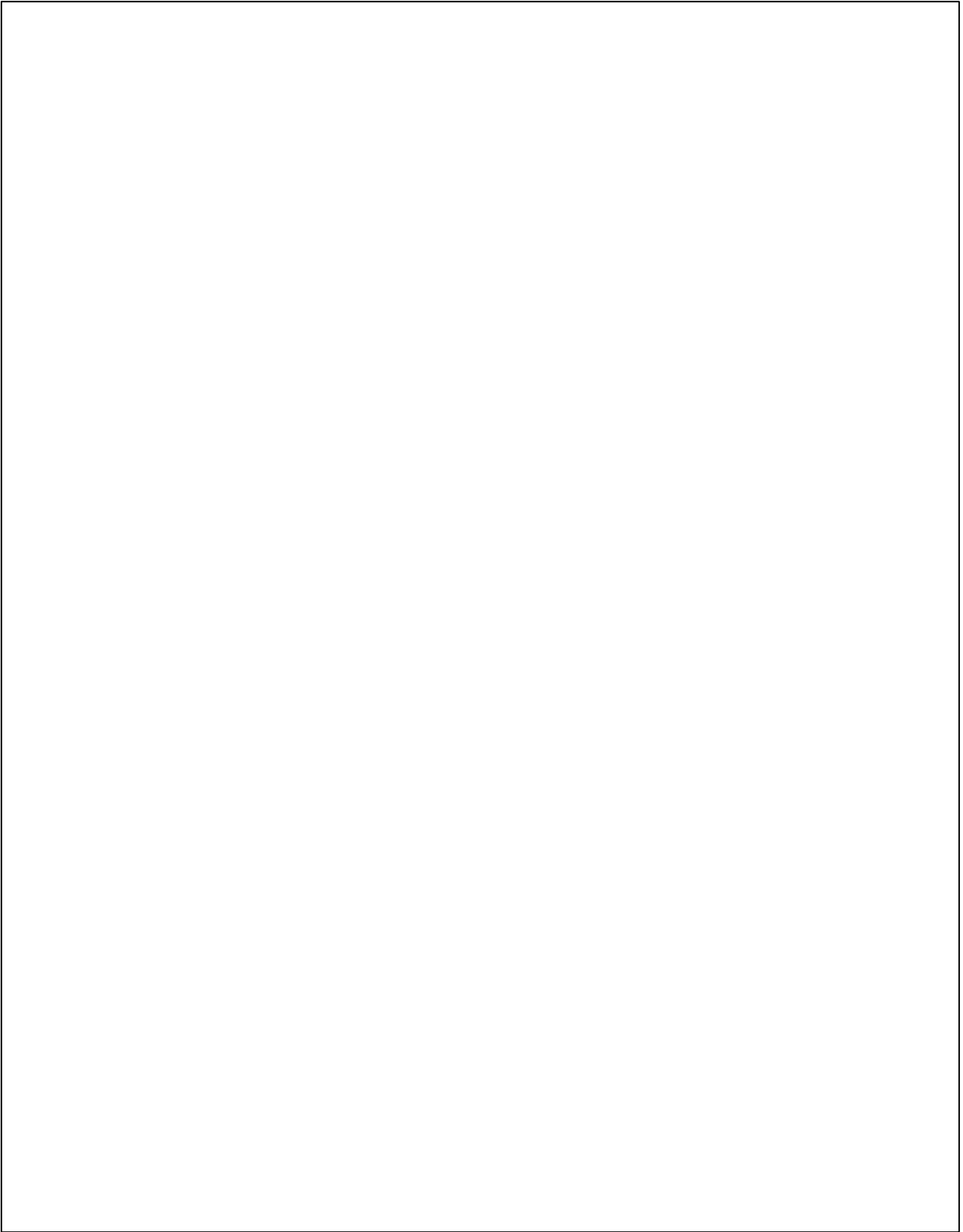
OBJECTIVE	STANDARD
<p><b>Statement of the competency</b></p> <p>To apply a critical thought process to world views.</p> <p><b>Elements</b></p> <p>1 To describe world views.</p> <p>2 To explain the major ideas, values, and implications of a world view.</p> <p>3 To organize the ideas, values and experiences of a world view into coherent patterns.</p> <p>4 To compare world views.</p>	<p><b>Performance criteria</b></p> <p>1.1 Accurate description of a society or group with a distinctive world view.</p> <p>1.2 Appropriate use of terminology relevant to these societies or groups.</p> <p>2.1 Adequate explanation of the salient components of a world view.</p> <p>3.1 Coherent organization of ideas about a world view.</p> <p>3.2 Appropriate expression, including a significant individual written component, of an analysis of the context, importance, and implications of world views.</p> <p>4.1 Comparative analysis of these world views.</p> <p>4.2 Appropriate inclusion of central elements, relationships, and organizational principles of the societies or groups in the analysis.</p>

**LEARNING ACTIVITIES**

<p><b>Discipline :</b>  <b>Weighting :</b>  <b>Credits :</b></p>	<p>Humanities            3-0-3            2</p>
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FORMATION GÉNÉRALE COMMUNE : LANGUE SECONDE (NIVEAU I) CODE : 0017

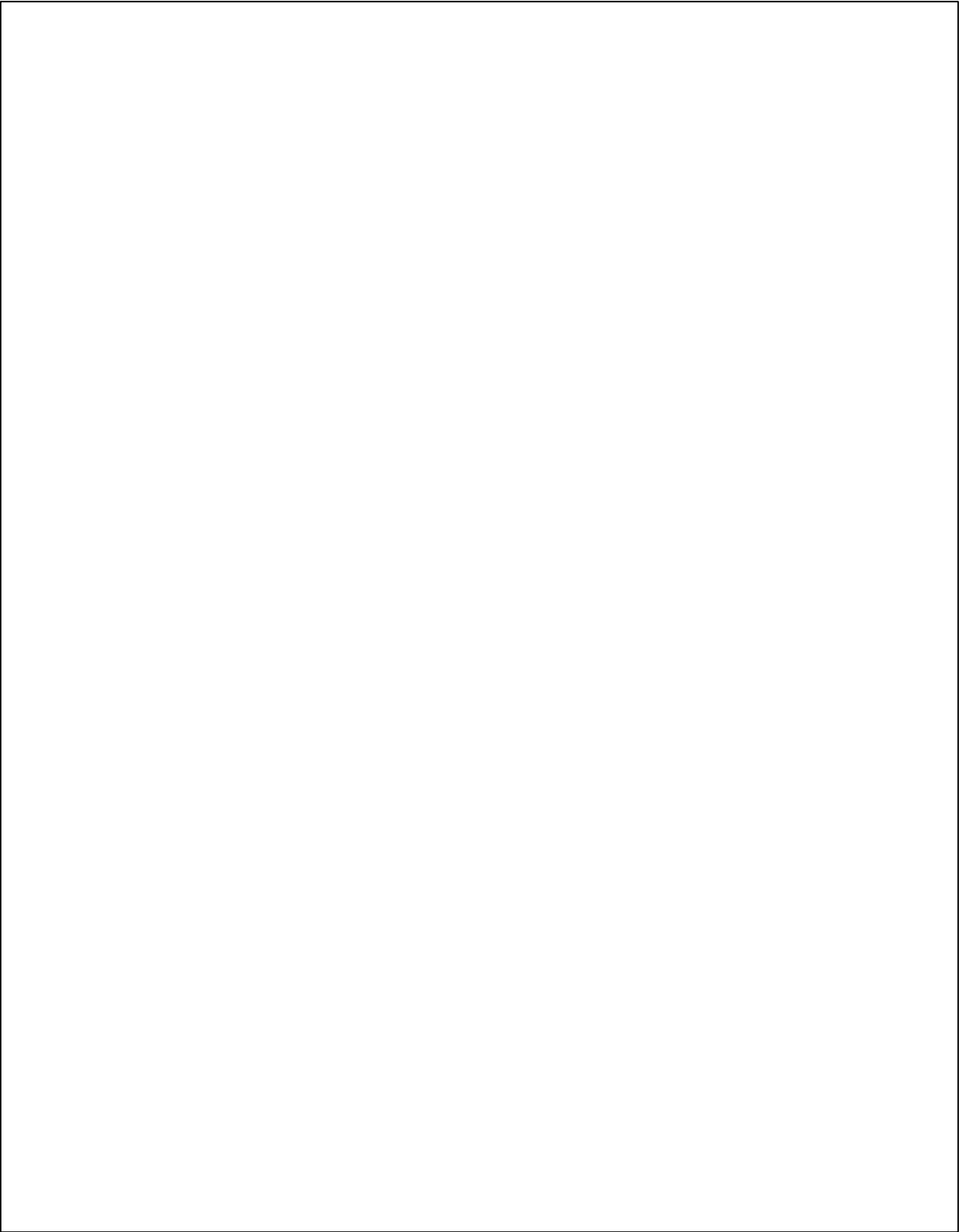
OBJECTIF	STANDARD
<p><b>Énoncé de la compétence</b></p> <p>Appliquer les notions de base de la communication en français courant.</p> <p><b>Éléments</b></p> <p>1 Dégager le sens d'un message oral simple.</p> <p>2 Émettre un message oral simple.</p> <p>3 Dégager le sens d'un texte.</p> <p>4 Rédiger un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

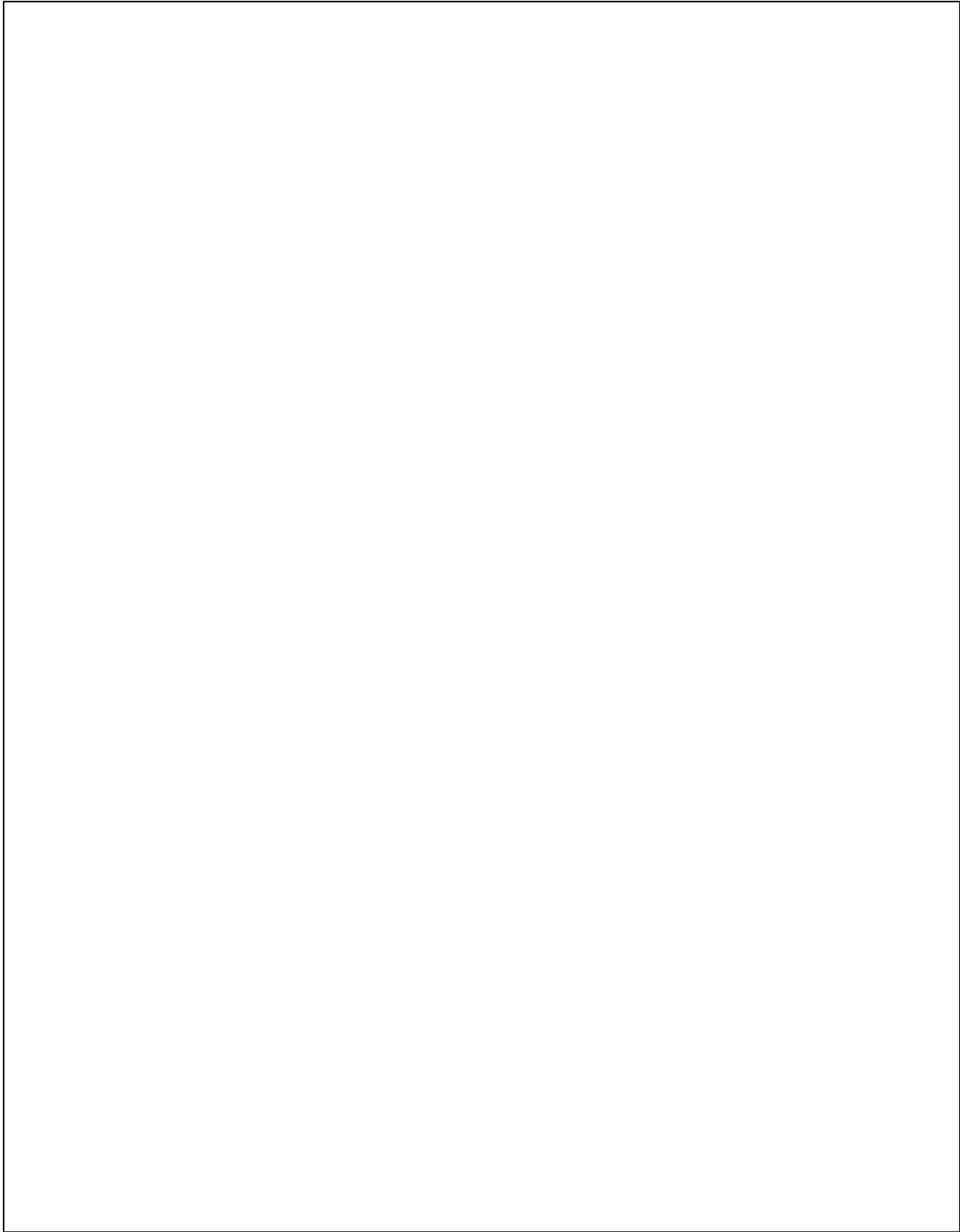


OBJECTIF	STANDARD
<p>Formulation claire et cohérente du propos.</p> <p><b>Énoncé de la compétence</b></p> <p>Communiquer avec aisance en français.</p> <p><b>Éléments</b></p> <p>1 Produire un texte oral planifié de cinq minutes de complexité moyenne.</p> <p>Formulation claire et cohérente du propos.</p>	<p><b>Critères de performance</b></p> <p>1.1 Emploi pertinent du vocabulaire courant.</p> <p>1.2 Adaptation à l'interlocuteur ou à l'interlocutrice.</p> <p>1.3 Respect du niveau de langue, du code grammatical et des règles de la prononciation.</p> <p>1.4 Formulation claire et cohérente du propos.</p> <p>1.5 Agencement pertinent des idées.</p>



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





GENERAL EDUCATION COMMON TO ALL PROGRAMS :

**OBJECTIVES AND STANDARDS -  
GENERAL EDUCATION ADAPTED TO PROGRAMS**

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OBJECTIVE	STANDARD
<p><b>Statement of the competency</b></p> <p>To communicate in the forms of discourse appropriate to one or more fields of study.</p> <p><b>Elements</b></p> <p>1 To identify the forms of discourse appropriate to given fields of study.</p> <p>2 To recognize the discursive frameworks appropriate to given fields of study.</p> <p>3 To formulate a discourse.</p>	<p><b>Performance criteria</b></p> <p>1.1 Accurate recognition of specialized vocabulary and conventions.</p> <p>1.2 Accurate recognition of the characteristics of the form of discourse.</p> <p>2.1 Clear and accurate recognition of the main ideas and structure.</p> <p>2.2 Appropriate distinction between fact and argument</p> <p>3.1 Appropriate choice of tone and diction.</p> <p>3.2 Correctly developed sentences.</p> <p>3.3 Clearly and coherently developed paragraphs.</p> <p>3.4 Appropriate use of program-related communication strategies.</p> <p>3.5 Formulation of a 1000-word discourse.</p> <p>3.6 Thorough revision of form and content.</p>
<p><b>LEARNING ACTIVITIES</b></p>	
<p><b>Discipline :</b> English</p> <p><b>Total Contact Hours :</b> 60</p> <p><b>Credits :</b> 2</p>	

OBJECTIVE	STANDARD
<p><b>Statement of the competency</b></p> <p>To apply a critical thought process to ethical issues relevant to the field of study.</p> <p><b>Elements</b></p> <ol style="list-style-type: none"> <li>1 To situate significant ethical issues, in appropriate world views and fields of knowledge.</li>   <li>2 To explain the major ideas, values, and social implication of ethical issues.</li>   <li>3 To organize the ethical questions and their implications into coherent patterns.</li>   <li>4 To debate the ethical issues.</li> </ol>	<p><b>Performance criteria</b></p> <ol style="list-style-type: none"> <li>1.1 Accurate recognition of the basic elements of ethical issues.</li> <li>1.2 Appropriate use of relevant terminology.</li> <li>1.3 Adequate identification of the main linkages with world views and fields of knowledge.</li>   <li>2.1 Adequate description of the salient components of the issues.</li>   <li>3.1 Coherent organization of the ethical questions and their implications.</li> <li>3.2 Appropriate expression, including a significant individual written component, of an analysis of the context, importance and implications of the issues.</li>   <li>4.1 Adequate development of substantiated argumentation including context and diverse points of view.</li> <li>4.2 Clear articulation of an individual point of view.</li> </ol>
<b>LEARNING ACTIVITIES</b>	
<p><b>Discipline :</b> Humanities</p> <p><b>Total Contact Hours :</b> 45</p> <p><b>Credits :</b> 2</p>	



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

OBJECTIVE	STANDARD
<p><b>Énoncé de la compétence</b></p> <p>Communiquer en français dans un champ d'études particulier.</p> <p><b>Elements</b></p> <ol style="list-style-type: none"> <li>1 Distinguer les types de textes propres au champ d'études.</li> <li>2 Interpréter des textes représentatifs du champ d'études.</li> <li>3 Utiliser des techniques de production de textes appropriées au champ d'études.</li> </ol>	<p><b>Performance criteria</b></p> <ol style="list-style-type: none"> <li>1.1 Distinction précise des caractéristiques formelles de chacun des principaux types de textes et des conventions utilisées.</li> <li>2.1 Distinction claire des principaux éléments du texte.</li> <li>2.2 Interprétation claire du vocabulaire spécialisé.</li> <li>2.3 Repérage précis des idées et des sujets traités.</li> <li>2.4 Utilisation pertinente des techniques de lecture et d'écoute.</li> <li>3.1 Emploi pertinent du vocabulaire spécialisé et des conventions.</li> <li>3.2 Respect du niveau de langue et du code grammatical.</li> <li>3.3 Formulation claire et cohérente du propos.</li> <li>3.4 Utilisation pertinente des techniques d'expression.</li> </ol>
<p>ACTIVITÉS D'APPRENTISSAGE d</p>	

OBJECTIVE	STANDARD
<p><b>Énoncé de la compétence</b></p> <p>Communiquer avec aisance en français dans un champ d'études particulier.</p> <p><b>Elements</b></p> <p>1 Commenter des textes propres au champ d'études.</p> <p>2 Produire un texte sur un sujet lié au champ d'études.</p>	<p><b>Performance criteria</b></p> <p>1.1 Distinction précise des caractéristiques formelles des principaux types de textes et des conventions utilisées.</p> <p>1.2 Explication précise du sens des mots dans le texte.</p> <p>1.3 Repérage précis de la structure du texte.</p> <p>1.4 Reformulation juste des idées principales et secondaires, des faits et des opinions.</p> <p>1.5 Emploi juste du vocabulaire spécialisé.</p> <p>2.1 Respect du sujet.</p> <p>2.2 Emploi pertinent du vocabulaire spécialisé et des conventions.</p> <p>2.3 Respect du niveau de langue et du code grammatical.</p> <p>2.4 Formulation claire et cohérente du propos.</p> <p>2.5 Agencement pertinent des idées.</p> <p>2.6 Adéquation entre forme et fond.</p>
<p><b>ACTIVITÉS D'APPRENTISSAGE</b></p> <p><b>Discipline :</b> Français, langue seconde</p> <p><b>Nombre d'heures-contact :</b> 45</p> <p><b>Nombre d'unités :</b> 2</p>	

FORMATION GÉNÉRALE PROPRE

**OBJECTIVES AND STANDARDS –  
COMPLEMENTARY GENERAL EDUCATION**

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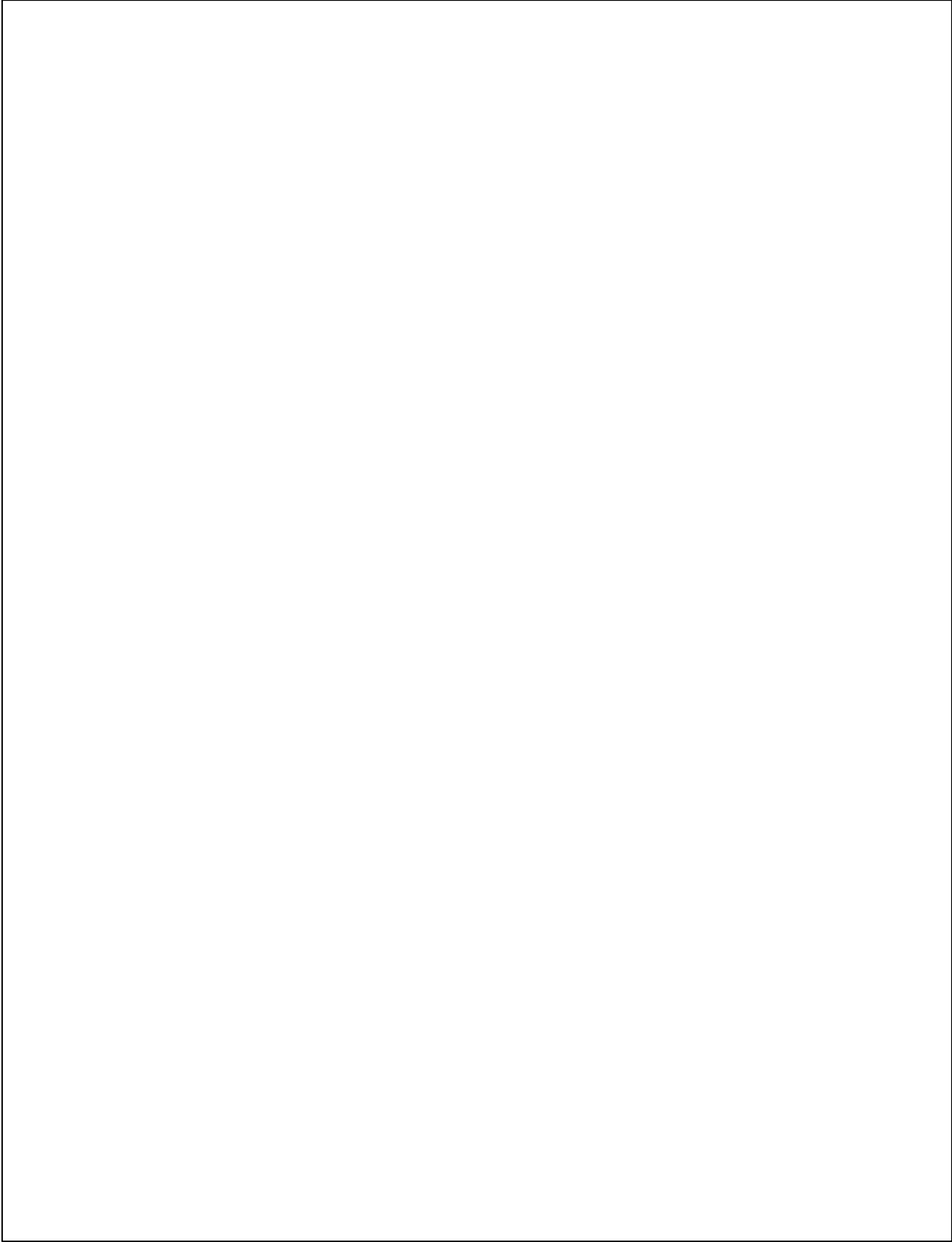
OBJECTIVE	STANDARD
<p><b>Statement of the competency</b></p> <p>To estimate the contribution of the social sciences to an understanding of contemporary issues.</p> <p><b>Elements</b></p> <ol style="list-style-type: none"> <li>1 Recognize the focus of one or more of the social sciences and their main approaches.</li> <li>2 Identify some of the issues currently under study in the social sciences.</li> <li>3 Demonstrate the contribution of one or more of the social sciences to an understanding of contemporary issues.</li> </ol>	<p><b>Achievement context</b></p> <ul style="list-style-type: none"> <li>• Students will work alone.</li> <li>• They will write an essay of approximately 750 words on the contribution of the social sciences to an understanding of contemporary issues.</li> <li>• Documents and data from the field of social sciences may be used.</li> </ul> <p><b>Performance criteria</b></p> <ol style="list-style-type: none"> <li>1.1 Formulation of the focus specific to one or more of the social sciences.</li> <li>1.2 Description of the main approaches used in the social sciences.</li> <li>2.1 Association of issues with the pertinent areas of research in the social sciences.</li> <li>3.1 Presentation of contemporary issues by emphasizing the interpretation of the social sciences.</li> <li>3.2 Illustration of the interaction between certain social changes and the contribution of the social sciences.</li> </ol>

LEARNING ACTIVITIES









COMPLEMENTARY GENERAL EDUCATION: MODERN LANGUAGES		CODE: 000Z
OBJECTIVE	STANDARD	
<p><b>Statement of the competency</b></p> <p>To communicate with limited skill* in a modern language.</p> <p>(*This refers to the limited use of language structures, grammar and vocabulary. This limitation varies depending on the complexity of the modern language.)</p> <p><b>Elements</b></p> <p>1 Understand the meaning of a verbal message.</p> <p>2 Understand the meaning of a written message.</p> <p>3 Express a simple message verbally.</p> <p>4 Write a text on a given subject.</p>	<p><b>Achievement context</b></p> <p>For modern languages that use the Latin alphabet, students will:</p> <ul style="list-style-type: none"> <li>• have a conversation that includes at least 8 lines of dialogue</li> <li>• write a text consisting of at least 8 sentences</li> </ul> <p>For modern languages that use a writing system other than the Latin alphabet, students will:</p> <ul style="list-style-type: none"> <li>• have a conversation that includes at least 6 lines of dialogue</li> <li>• write a text consisting of at least 6 sentences</li> </ul> <p>Students will be exposed to learning situations on familiar themes. Reference materials may be used.</p> <p><b>Performance criteria</b></p> <p>1.1 The acquisition of a modern language requires an awareness of the culture of the people who use the language.</p> <p>1.2 Accurate identification of words and idiomatic expressions.</p> <p>1.3 Clear recognition of the general meaning of simple messages.</p> <p>1.4 Logical connection between the various elements of the message.</p> <p>2.1 Accurate identification of words and idiomatic expressions.</p> <p>2.2 Clear recognition of the general meaning of simple messages.</p> <p>2.3 Logical connection between the various elements of the message.</p> <p>3.1 Appropriate use of language structures in main and coordinate clauses.</p> <p>3.2 Appropriate application of grammar rules.</p> <p>3.3 Use of verbs in the present indicative.</p> <p>3.4 Appropriate use of basic vocabulary and idiomatic expressions.</p> <p>3.5 Understandable pronunciation.</p> <p>3.6 Coherent sequence of simple sentences.</p> <p>3.7 Spontaneous and coherent sequence of sentences during a conversation.</p> <p>4.1 Appropriate use of language structures in main and coordinate clauses.</p> <p>4.2 Appropriate application of basic grammar rules.</p> <p>4.3 Use of verbs in the present indicative.</p> <p>4.4 Appropriate use of basic vocabulary and idiomatic expressions.</p> <p>4.5 Coherent sequence of simple sentences.</p> <p>4.6 Acceptable application of graphic rules for writing systems other than the Latin alphabet.</p>	
<b>LEARNING ACTIVITIES</b>		
<b>Number of student-contact hours :</b>	45	
<b>Number of credits :</b>	2	

OBJECTIVE	STANDARD
<p><b>Statement of the competency</b></p> <p>To communicate on familiar topics in a modern language.</p> <p><b>Elements</b></p> <p>1 Understand the meaning of a verbal message.</p> <p>2 Understand the meaning of a written message.</p> <p>3 Express a simple message verbally, using sentences of average complexity.</p>	<p><b>Achievement context</b></p> <ul style="list-style-type: none"> <li>• Students will have a conversation that includes at least 15 lines of dialogue.</li> <li>• They will write a text consisting of at least 20 sentences for Latin-alphabet languages.</li> <li>• They will write a text consisting of at least 10 sentences for languages not using the Latin alphabet.</li> <li>• Students will be exposed to:                             <ul style="list-style-type: none"> <li>- common situations in everyday life</li> <li>- simple topics from everyday life</li> </ul> </li> <li>• Reference materials may be used.</li> </ul> <p><b>Performance criteria</b></p> <p>The acquisition of a modern language requires an awareness of the culture of the people who use the language.</p> <p>1.1 Accurate identification of words and idiomatic expressions.</p> <p>1.2 Clear recognition of the general meaning and essential ideas of messages of average complexity.</p> <p>1.3 Logical connection between the various elements of the message.</p> <p>2.1 Accurate identification of words and idiomatic expressions.</p> <p>2.2 Clear recognition of the general meaning and essential ideas of messages of average complexity.</p> <p>2.3 Logical connection between the various elements of the message.</p> <p>3.1 Appropriate use of language structures in main or subordinate clauses. 3</p> <p>3.2 Appropriate application of grammar rules.</p> <p>3.3 Use of verbs in the present indicative.</p> <p>3.4</p>

OBJECTIVE	STANDARD
<p><b>Statement of the competency</b></p> <p>To communicate with relative ease in a modern language.</p> <p><b>Elements</b></p> <p>1 Understand the meaning of a verbal message in everyday language.</p> <p>2 Understand the meaning of a text of average complexity.</p> <p>3 Have a conversation on a subject.</p> <p>4 Write a text of average complexity.</p>	<p><b>Achievement context</b></p> <ul style="list-style-type: none"> <li>• Students will work alone.</li> <li>• They will have a conversation that includes at least 20 lines of dialogue.</li> <li>• They will write a text of medium length (at least 25 sentences for Latin-alphabet languages and 15 sentences for other languages).</li> <li>• They will use documents of a sociocultural nature. Reference materials for the written text may be used.</li> </ul> <p><b>Performance criteria</b></p> <p>The acquisition of a modern language requires an awareness of the culture of the people who use the language.</p> <p>1.1 Accurate explanation of the general meaning and essential ideas of the message.</p> <p>1.2 Clear identification of structural elements of the language.</p> <p>2.1 Accurate explanation of the general meaning and essential ideas of the text.</p> <p>2.2 Clear identification of structural elements of the language.</p> <p>3.1 Appropriate use of the structural elements of the language according to the message to be expressed.</p> <p>3.2 Appropriate use of everyday vocabulary.</p> <p>3.3 Accurate pronunciation and intonation.</p> <p>3.4 Normal flow in a conversation in everyday language.</p> <p>3.5 Coherence of the message expressed.</p> <p>3.6 Pertinent responses to questions.</p> <p>4.1 Appropriate use of the structural elements of the language according to the text to be written.</p> <p>4.2 Accurate vocabulary.</p> <p>4.3 Coherence of the text as a whole.</p> <p>4.4 Observance of presentation and writing rules applicable to the text.</p>
<b>LEARNING ACTIVITIES</b>	
<p><b>Number of student-contact hours :</b></p>	<p>45</p>
<p><b>Number of credits :</b></p>	<p>2</p>

OBJECTIVE

STANDARD

**Statement of the competency**

To recognize

OBJECTIVE	STANDARD
<p><b>Statement of the competency</b></p> <p>To use various mathematical or computer concepts, procedures and tools for common tasks.</p> <p><b>Elements</b></p> <ol style="list-style-type: none"> <li>1 Demonstrate the acquisition of basic functional knowledge in mathematics or informatics.</li> <li>2 Select mathematical or computer tools and procedures on the basis of specific needs.</li> <li>3 Use mathematical or computer tools and procedures to carry out tasks and solve problems.</li> <li>4 Interpret the quantitative data or results obtained using mathematical or computer tools and procedures.</li> </ol>	<p><b>Achievement context</b></p> <ul style="list-style-type: none"> <li>• Students will work alone.</li> <li>• They will carry out a task or solve a problem based on everyday needs.</li> <li>• Familiar tools and reference materials may be used.</li> </ul> <p><b>Performance criteria</b></p> <ol style="list-style-type: none"> <li>1.1 Brief definition of concepts.</li> <li>1.2 Correct execution of basic operations.</li> <li>1.3 Appropriate use of terminology.</li> <li>2.1 List of numerous possibilities available with mathematical and computer tools and procedures.</li> <li>2.2 Analysis of concrete situations and recognition of the usefulness of mathematical or computer tools and procedures.</li> <li>2.3 Appropriate choice according to needs.</li> <li>3.1 Planned, methodical process.</li> <li>3.2 Correct use of tools and procedures.</li> <li>3.3 Satisfactory results, given the context.</li> <li>3.4 Appropriate use of terminology specific to a tool or procedure.</li> <li>4.1 Accurate interpretation, given the context.</li> <li>4.2 Clear, precise formulation of the interpretation.</li> </ol>

LEARNING ACTIVITIES

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

OBJECTIVE	STANDARD
<p><b>Statement of the competency</b></p> <p>To consider various forms of art produced by aesthetic practices.</p> <p><b>Elements</b></p> <ol style="list-style-type: none"> <li>1 Develop an appreciation for the dynamics of the imagination in art.</li> <li>2 Describe art movements.</li> <li>3 Give a commentary on a work of art.</li> </ol>	<p><b>Achievement context</b></p> <ul style="list-style-type: none"> <li>• Students will work alone.</li> <li>• They will use a specified work of art and write a commentary of approximately 750 words.</li> </ul> <p><b>Performance criteria</b></p> <ol style="list-style-type: none"> <li>1.1 Precise explanation of a creative process connected to the construction of an imaginary universe.</li> <li>2.1 Descriptive list of the main characteristics of three art movements from different eras, including a modern movement.</li> <li>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.</li> </ol>

**LEARNING ACTIVITIES**

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



OBJECTIVE	STANDARD
<p><b>Statement of the competency</b></p> <p>To produce a work of art.</p> <p><b>Elements</b></p> <ol style="list-style-type: none"> <li>1 Recognize the primary forms of expression of an artistic medium.</li> <li>2 Use the medium.</li> </ol>	<p><b>Achievement context</b></p> <ul style="list-style-type: none"> <li>• Students will work alone.</li> <li>• of the language and techniques specific to the medium selected.</li> </ul> <p><b>Performance criteria</b></p> <ol style="list-style-type: none"> <li>1.1 Identification of specific features: originality, essential qualities, means of communication, styles, genres.</li> <li>2.1 Personal, coherent use of elements of language.</li> <li>2.2 Satisfactory application of artistic techniques.</li> <li>2.3 Observance of the requirements of the method of production.</li> </ol>



**OBJECTIVES AND STANDARDS -  
SPECIFIC PROGRAM COMPONENT**

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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, refer to documentation, refer to documentation

CODE : 012E	
<b>HARMONIZATION</b> This competency is equivalent to Module 2 of <i>Industrial Drafting</i> (DVS) and Module 2 of <i>Machining Techniques</i> (DVS), as well as competency 011Q of <i>Aircraft Manufacturing Technology</i> (DEC).	
OBJECTIF	STANDARD
<p><b>Statement of the competency</b> To solve problems related to industrial mechanics.</p> <p><b>Elements</b></p> <ol style="list-style-type: none"> <li>To analyze situations involving variables.</li> <li>To identify dimensions and coordinates for complex objects.</li> </ol>	<p><b>Achievement context</b></p> <ul style="list-style-type: none"> <li>Using situations related to mechanical engineering.</li> <li>Given: <ul style="list-style-type: none"> <li>tables, graphs and reference manuals;</li> <li>relevant software, such as a spreadsheet, bearing in mind the evolution of the market.</li> </ul> </li> <li>Applying problem-solving strategies.</li> </ul> <p><b>Performance criteria</b></p> <ol style="list-style-type: none"> <li>Appropriate selection and use of units of measurement.</li> <li>Detailed graphic representation of the problem to be solved.</li> <li>Use of algebra to describe the links between the following variables: direct, inverse, affine, exponential.</li> <li>Observance of rules related to round numbers.</li> <li>Appropriate use of scientific notation in carrying out calculations.</li> <li>Correct results obtained.</li> <li>Correct interpretation of results according to the problem.</li> <li>Geometric illustration of the problem in graphic form.</li> <li>Detailed analysis of the problem.</li> <li>Proper identification of the trigonometric functions to be used.</li> <li>Accurate conversion of problem into an algebraic equation.</li> <li>Accurate calculation of angles and segments using trigonometric ratios.</li> <li>Accurate calculation of coordinates.</li> </ol>

CODE : 012E

<p>3. To prepare estimates using matrices.</p>	<p>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.</p>
<p>4. To analyze the forces exerted on an object.</p>	<p>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.</p>
<p>5. To analyze the variables of outputs, speeds and accelerations.</p>	<p>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.</p>
<p>6. To extend to different fields of application.</p>	<p>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.</p>



CODE : 012F

**HARMONIZATION**

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

OBJECTIF	STANDARD
<p><b>Statement of the competency</b> To interpret technical drawings.</p> <p style="text-align: center;">G or 17ther i v</p> <p><b>Elements</b> 1 -</p>	<p><b>Achievement context</b></p> <ul style="list-style-type: none"><li>• Given:<ul style="list-style-type: none"><li>- detail and assembly drawings in metric and imperial units of measurement;</li><li>- drawings illustrating an assembly method or other illustrations;</li><li>- instructions;</li><li>- technical documentation, n ilPropeiond.25if:</li><li>- tables;</li><li>- drafting standards.</li></ul></li></ul> <p><b>Performance criteria</b></p>

CODE : 012F

2 To interpret the dimensioning.

3. To find complementary information in technical drawings.

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.

3.1 Proper identification of information in:

- title block;
- list of terms used;
- annotations.

list of terms used;

- annotations.

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
<p><b>Statement of the competency</b> To sketch objects.</p>	<p><b>Achievement context</b></p> <ul style="list-style-type: none"><li>• Given:<ul style="list-style-type: none"><li>- detail and assembly drawings in metric and imperial units of measurement;</li><li>- American and European orthographic projections;</li><li>- axonometric projections;</li><li>- real parts to be sketched;</li><li>- plotting and isometric paper;</li><li>-</li></ul></li></ul>

CODE : 012G

<p>2 To sketch axonometric projections.</p> <p>3 To sketch sectional, auxiliary and partial views.</p> <p>4 To dimension the sketch.</p>	<p>2.1 Conformity with standards and conventions related to:</p> <ul style="list-style-type: none"><li>- lines;</li><li>- isometric drawings;</li><li>- oblique projections.</li></ul> <p>2.2 Accurate identification of dimensions of the part to be sketched.</p> <p>2.3 Observance of proportions.</p> <p>2.4 Observance of shapes of the object to be sketched using skewed lines and ellipses.</p> <p>2.5 Observance of sketching techniques.</p> <p>2.6 Accurate, neat sketch.</p> <p>3.1 Conformity with standards and conventions related to:</p> <ul style="list-style-type: none"><li>- lines;</li><li>- hatching lines;</li><li>- sections.</li></ul> <p>3.2 Appropriate choice of section.</p> <p>3.3 Observance of proportions and shapes of the object to be sketched.</p> <p>3.4 Observance of sketching techniques.</p> <p>3.5 Accurate, neat sketch.</p> <p>4.1 Conformity with standards and conventions related to:</p> <ul style="list-style-type: none"><li>- extension lines;</li><li>- dimension lines;</li><li>- conventional and absolute dimensioning;</li><li>- notation of dimensions in axonometric projections.</li></ul> <p>4.2 Proper arrangement of dimensions.</p> <p>4.3 Dimensioning adapted to manufacturing.</p> <p>4.4 Appropriate tolerance limits and surface finishes according to the role of the part or one of its components.</p> <p>4.5 Proper use of symbols.</p> <p>4.6 Proper use of metric and imperial systems of measurement.</p> <p>4.7 Neat, clear dimensioning.</p>
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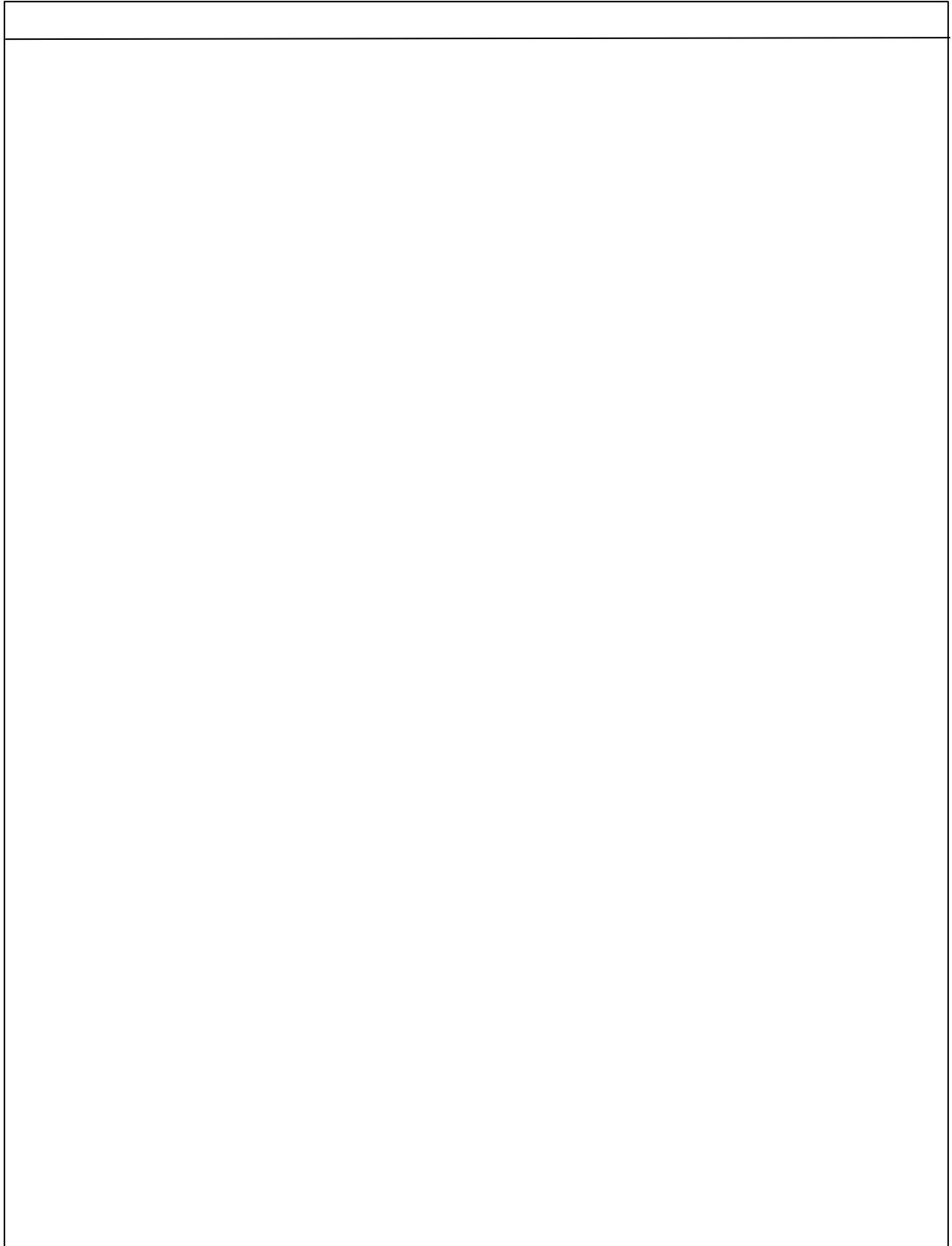


CODE : 012H

**HARMONIZATION**

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

OBJECTIF	STANDARD
<p><b>Statement of the competency</b> To interpret technical information about materials and manufacturing processes.</p> <p><b>Elements</b></p> <ol style="list-style-type: none"><li>1. To describe the materials presented in the drawings.</li><li>2. To determine the surface conditions and the tolerances of the part.</li><li>3. To describe the manufacturing processes presented in the documentation.</li></ol>	<p><b>Achievement context</b></p> <ul style="list-style-type: none"><li>• Using metallic, non-metallic and composite materials.</li><li>• Given technical documentation in English and French:<ul style="list-style-type: none"><li>- technical drawings;</li><li>- reference manuals relating to materials, such as <i>The Machinery's Handbook</i>;</li><li>- catalogues of ferrous products;</li><li>- data sheets, tables and standards, such as ANSI, SAE, ASTM and CSA.</li></ul></li></ul> <p><b>Performance criteria</b></p> <ol style="list-style-type: none"><li>1.1 Proper identification of the types of materials used in the part.</li><li>1.2 Accurate identification of the physical, mechanical and chemical properties presented in the technical documentation.</li><li>1.3 Accurate interpretation of Canadian, American and international material identification codes.</li><li>1.4 Accurate interpretation of specifications contained in tables.</li><li>1.5 Rough calculation of strength of material.</li><li>2.1 Accurate interpretation of symbols.</li><li>2.2 Appropriate association of surface conditions with the corresponding tolerances.</li><li>3.1 Appropriate determination of characteristic processes for:<ul style="list-style-type: none"><li>- moulding;</li><li>- shaping;</li><li>- machining;</li><li>- welding;</li><li>- assembling;</li><li>- sintering.</li></ul></li><li>3.2 Appropriate association of processing methods with their applications in different manufacturing sectors.</li></ol>





CODE : 012J	
<b>HARMONIZATION</b> The content of competencies 012J and 012K of the present program corresponds to competency 011W of <i>Aircraft Manufacturing Technology</i> (DEC).	
OBJECTIF	STANDARD
<p><b>Statement of the competency</b> To analyze the internal and external forces exerted on a mechanical object.</p> <p><b>Elements</b></p> <p>1 To analyze the external forces exerted on a structure or a mechanical object.</p> <p>2. To analyze the strength of materials.</p>	<p><b>Achievement context</b></p> <ul style="list-style-type: none"> <li>• Given:           <ul style="list-style-type: none"> <li>- set-ups applied to the design and planning of the manufacturing;</li> <li>- calculators, tables and nomographs;</li> <li>- technical documentation related to the sector of application.</li> </ul> </li> <li>• Applying problem-solving strategies.</li> </ul> <p><b>Performance criteria</b></p> <p>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.</p> <p>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.</p>

CODE : 012J

<p>3. To analyze kinematic motion in assemblies and systems.</p> <p>4. To analyze forces exerted in a mechanism.</p> <p>5. To analyze the energy generated in a mechanism.</p>	<p>3.1 Accurate determination of the types of motions involved.</p> <p>3.2 Accurate determination of parameters, according to the type of motion.</p> <p>3.3 Proper calculations for each type of motion.</p> <p>4.1 Detailed analysis of the causes and effects of motions (dynamics).</p> <p>4.2 Accurate calculation of forces and their effects.</p> <p>4.3 Due consideration given to dynamic principles.</p> <p>4.4 Accurate determination of the forces needed to generate a given motion.</p> <p>5.1 Accurate determination of the relationship between the work and the energy generated.</p> <p>5.2 Accurate calculation of work and energy.</p> <p>5.3 Complete analysis of loss of energy.</p> <p>5.4 Due consideration given to principles of energy conservation.</p> <p>5.5 Accurate calculation of power and efficiency.</p> <p>5.6 Accurate determination of a mechanism's performance.</p>
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CODE : 012K	
<b>HARMONIZATION</b> The content of competencies 012J and 012K of the present program corresponds to competency 011W of <i>Aircraft Manufacturing Technology</i> (DEC).	
OBJECTIF	STANDARD
<b>Statement of the competency</b> To plan the application of heat treatments.	<b>Achievement context</b> <ul style="list-style-type: none"> <li>• Given:           <ul style="list-style-type: none"> <li>- a part made of steel, cast iron, aluminum alloy or copper;</li> <li>- relevant technical documentation in English and French.</li> </ul> </li> </ul>
<b>Elements</b> <ol style="list-style-type: none"> <li>1. To determine the properties needed for the part to be treated.</li> <li>2. To choose the material for the part.</li> <li>3. To choose the type of heat treatment.</li> <li>4. To determine quenching methods.</li> </ol>	<b>Performance criteria</b> <ol style="list-style-type: none"> <li>1.1 Accurate analysis of needs.</li> <li>1.2 Detailed list of conditions imposed.</li> <li>2.1 Detailed list of the parameters related to the use of the materials, using technical documentation provided.</li> <li>2.2 Accurate calculations to establish the required characteristics.</li> <li>2.3 Proper determination of the possibilities and limitations related to the treatment of a metal, based on its composition.</li> <li>2.4 Proper choice of material.</li> <li>3.1 Accurate determination of the preliminary and complementary processes needed for the heat treatment, according to the material.</li> <li>3.2 Proper choice of the type of heat treatment to be used, according to its characteristics and the need.</li> <li>3.3 Feasibility of treatment, according to industrial and commercial criteria.</li> <li>4.1 Due consideration given to quenching delays of the parts.</li> <li>4.2 Accurate determination of quenching method, according to the treatment selected.</li> </ol>

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.

CODE : 012L	
OBJECTIF	STANDARD
<p><b>Statement of the Competency</b> To do the engineering design of an object's fasteners.</p> <p><b>Elements of the Competency</b> 1. To interpret specifications.</p> <p>2. To characterize in detail an object's fasteners.</p>	<p><b>Achievement Context</b></p> <ul style="list-style-type: none"> <li>• Individually and in teams.</li> <li>• Designing or modifying a simple object involving direct bonding, devices and mechanisms.</li> <li>• Given: <ul style="list-style-type: none"> <li>- specifications, sketches and drawings;</li> <li>- catalogues and reference manuals, such as <i>The Machinery's Handbook</i>;</li> <li>- tables and nomographs.</li> </ul> </li> </ul> <p><b>Performance Criteria</b></p> <p>1.1 Accurate formulation of the object's global, principal and technological functions.</p> <p>1.2 Accurate determination of the forces and motions characteristic of the object.</p> <p>1.3 Accurate identification of expected performance criteria.</p> <p>1.4 Accurate identification of application constraints and manufacturing requirements related to the physical, human, technological and economic environment.</p> <p>1.5 Meticulous production of basic and kinematic sketches.</p> <p>1.6 Accurate interpretation of information in French.</p> <p>2.1 Proper differentiation among the fastening methods set out in the technical documentation.</p> <p>2.2 Methodical study of possible fastening methods, using problem-solving strategies.</p> <p>2.3 Proper choice of fastening methods.</p> <p>2.4 Accurate determination of locking method, according to the fasteners.</p> <p>2.5 Clear sketch of the steps taken to assemble the object.</p>

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
<p><b>Statement of the Competency</b> To use a computerized work station.</p> <p><b>Elements of the Competency</b></p> <ol style="list-style-type: none"><li>To prepare the work station.</li><li>To use basic functions of an operating system.</li></ol>	<p><b>Achievement Context</b></p> <ul style="list-style-type: none"><li>Given:<ul style="list-style-type: none"><li>a computerized work station, connected to a network and the information highway;</li><li>a word processing application and a spreadsheet;</li><li>English and French software;</li><li>relevant technical documentation.</li></ul></li></ul> <p><b>Performance Criteria</b></p> <ol style="list-style-type: none"><li>1.1 Accurate identification of a computerized work station's components.</li><li>1.2 Accurate identification and localization of a computer's components and peripherals.</li><li>1.3 Meticulous checking of connections.</li><li>1.4 Functional and ergonomic organization of work station.</li><li>1.5 Proper formatting of diskettes.</li><li>2.1 Proper use of the main functions of a graphic environment, such as windows, dialogue boxes, and menu, tool and scroll bars.</li><li>2.2 Proper procedures for creating, saving and printing documents.</li><li>2.3 Proper procedures for navigation and data transfer from one application to another.</li><li>2.4 Proper use of the main file management functions for various media, such as hard disks, diskettes and CD-ROMs.</li><li>2.5 Proper procedures for compressing and decompressing files.</li><li>2.6 Proper personalization of graphic environment, according to needs.</li><li>2.7 Proper shut-down procedures.</li></ol>

CODE



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*

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
<p><b>Statement of the Competency</b> To take and interpret measurements.</p> <p><b>Elements of the Competency</b> 1. To plan the work.</p>	<p><b>Achievement Context</b></p> <ul style="list-style-type: none"><li>• Given:<ul style="list-style-type: none"><li>- objects to be measured;</li><li>- assembly or detail drawings in metric and imperial units of measurement;</li><li>- measuring instruments and devices;</li><li>- a scientific calculator;</li><li>- inspection records;</li><li>- cleaning products and lubricants.</li></ul></li><li>• Using various reference materials, such as:<ul style="list-style-type: none"><li>- The Machinery's Handbook;</li><li>- tables and nomographs;</li><li>- conversion tables.</li></ul></li></ul> <p><b>Performance Criteria</b></p> <p>1.1 Understanding of the context and characteristics of the object to be measured.</p> <p>1.2 3 Tw (1.) Tj 85 0 T3D 0 Tc 0.1875 Tw ( ) Tj -141 -12TD -0.1</p>

CODE : 012P

3. To measure parts of different shapes.

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
<p><b>Statement of the Competency</b> To operate a conventional lathe.</p> <p><b>Elements of the Competency</b> 1. To interpret drawings and technical documentation.</p>	<p><b>Achievement Context</b></p> <ul style="list-style-type: none"><li>• For machining simple prototypes, involving at least turning, roughing, facing, grooving, tapering, threading, boring and reaming.</li><li>• Given:<ul style="list-style-type: none"><li>- a conventional lathe;</li><li>- detail drawings, a process sheet and operation manuals;</li><li>- bar stock of ferrous or non-ferrous material;</li><li>- cutting tools, tool holders and work- holding accessories;</li><li>- individual protective gear;</li><li>- tool catalogues and reference manuals in English and French, such as <i>The Machinery's Handbook</i>;</li><li>- appropriate testing instruments;</li><li>- WHMIS index cards.</li></ul></li><li>• Following occupational health and safety rules.</li></ul> <p><b>Performance Criteria</b></p> <ol style="list-style-type: none"><li>1.1 Thorough reading of the dimensional and geometric limits related to surfaces to be machined.</li><li>1.2 Accurate evaluation of the capacity and limitations of the machine tool, according to the object to be machined.</li><li>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.</li><li>1.4 Accurate interpretation.</li><li>1.5 Correct interpretation of information in French.</li></ol>

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 stragglings 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

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





CODE : 012R

CODE : 012R

<p>2. To adapt a process sheet to the type of machine tool used.</p>	<p>2.1 Complete description of the types of conventional milling machines:</p> <ul style="list-style-type: none"><li>- components;</li><li>- kinematic chain;</li><li>- coordinate system;</li><li>- capacities and limitations.</li></ul> <p>2.2 Accurate sketch of machining operations.</p> <p>2.3 Accurate calculation of the technological and mechanical parameters of each section.</p> <p>2.4 Realistic interpretation of cutting forces and straggling affecting the precision of the machining operations.</p> <p>2.5 Proper adaptation of the various machining operations, according to the machine tool used and the shape of the part.</p> <p>2.6 Proper choice of cutting tools, according to the geometric surface to be machined.</p> <p>2.7 Meticulous recording of the modifications on the process sheet, using the correct technical terminology.</p>
<p>3. To plan the work.</p>	<p>3.1 Detailed visual inspection of the machine tool components.</p> <p>3.2 Precise adjustment of machine tool, according to the technological and mechanical parameters of the cut.</p> <p>3.3 Meticulous grinding, installation and adjustment of cutting tools, according to the operations to be performed.</p> <p>3.4 Safe handling and installation of work-holding accessories.</p> <p>3.5 Meticulous, safe installation of workpiece.</p>
<p>4. To machine a prototype on a conventional milling machine.</p>	<p>4.1 Appropriate dry run.</p> <p>4.2 Proper observance of sequence of machining operations.</p> <p>4.3 Observance of techniques for performing the first cut and subsequent cuts.</p> <p>4.4 Safe use of machine tool.</p> <p>4.5 Observance of appropriate safety measures.</p> <p>4.6 Critical analysis of machining errors.</p> <p>4.7 Appropriate adjustments and corrections.</p> <p>4.8 Disassembling and meticulous deburring of parts.</p>

CODE : 012R

5.





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  
4.3

CODE : 012T

**HARMONIZATION**

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

OBJECTIF	STANDARD
<p><b>Statement of the Competency</b> To determine the geometric tolerances required for an assembly.</p> <p><b>Elements of the Competency</b></p> <ol style="list-style-type: none"><li>1. To gather the information.</li><li>2. To analyze geometric operating conditions.</li><li>3. To choose the type of geometric tolerances.</li><li>4. To calculate the geometric tolerances of dimensioning.</li></ol>	<p><b>Achievement Context</b></p> <ul style="list-style-type: none"><li>• For a mechanical object comprising an assembly of parts.</li><li>• Given:<ul style="list-style-type: none"><li>- technical drawings and pre-established data;</li><li>- existing industrial standards;</li><li>- a computerized work station;</li><li>- relevant technical documentation in English and French.</li></ul></li></ul> <p><b>Performance Criteria</b></p> <ol style="list-style-type: none"><li>1.1 Detailed recording of dimensions.</li><li>1.2 Accurate interpretation of the assembly drawing and the detail drawings.</li><li>2.1 Proper understanding of kinematic conditions.</li><li>2.2 Proper analysis of an assembly's least favourable conditions.</li><li>3.1 Proper choice of tolerance type with regard to orientation, position and backlash, given the kinematic conditions of the object.</li><li>3.2 Proper choice of tolerance type with regard to orientation and position, given the fastening devices of the object.</li><li>3.3 Proper choice of shape tolerance, according to the operation of the mechanism's parts.</li><li>3.4 Proper choice of geometric tolerancing references.</li><li>4.1 Understanding of the possibilities and limitations in manufacturing processes.</li><li>4.2 Due consideration given to projection of the tolerance, as needed.</li><li>4.3 Proper choice of method of calculation.</li><li>4.4 Accurate calculation of geometric dimensions.</li><li>4.5 Accurate calculation of transfers of geometric dimensions.</li></ol>

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 tolerance on thbwingl



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
<p><b>Statement of the Competency</b> To produce assembly drawings.</p> <p><b>Elements of the Competency</b></p> <ol style="list-style-type: none"><li>1. To interpret detail drawings.</li>          <li>2. To plan the work.</li>          <li>3. To draw the parts to be manufactured.</li></ol>	<p><b>Achievement Context</b></p> <ul style="list-style-type: none"><li>• Drawing a mechanical object made up of fasteners and a maximum of 15 parts.</li><li>• Given:<ul style="list-style-type: none"><li>- a sketch and detail drawings in English and French;</li><li>- a computerized work station;</li><li>- a computer-aided drafting (CAD) application;</li><li>- relevant technical documentation in English and French.</li></ul></li></ul> <p><b>Performance Criteria</b></p> <ol style="list-style-type: none"><li>1.1 Accurate description of the function of each part illustrated on the drawings.</li><li>1.2 Accurate identification of the layout method of the parts.</li><li>1.3 Accurate description of the object's function.</li><li>1.4 Correct translation of the French technical terms used in drawings.</li> <li>2.1 Proper choice of reference materials.</li><li>2.2 Accurate determination of the object's orientation, according to:<ul style="list-style-type: none"><li>- use;</li><li>- relationship to another object.</li></ul></li><li>2.3 Proper choice of views.</li><li>2.4 Proper layout of views in sketch form.</li><li>2.5 Functional and ergonomic organization of work station.</li> <li>3.1 Observance of dimensions and scale.</li><li>3.2 Accurate layout of parts.</li><li>3.3 Proper use of CAD software specialized commands.</li></ol>

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	
<b>HARMONIZATION</b> This competency is equivalent to Modules 20 and 22 of <i>Machining Techniques</i> (DVS) and to Modules 5 and 7 of <i>Numerical Control Machine Tool Operation</i> (AVS).	
OBJECTIF	STANDARD
<b>Statement of the Competency</b> To operate a numerical control machine tool.	<b>Achievement Context</b> <ul style="list-style-type: none"> <li>• Machining a simple prototype.</li> <li>• Preparing a numerical control machine tool for production.</li> <li>• Given:             <ul style="list-style-type: none"> <li>– a milling machine and a numerical control lathe;</li> <li>– an existing machining program;</li> <li>– detail drawings, a process sheet and operation manuals;</li> <li>– bar stock of ferrous or non-ferrous material;</li> <li>– cutting tools, tool holder and work-holding accessories;</li> <li>– individual protective gear;</li> <li>– tool catalogues and reference materials in English and French, such as <i>The Machinery's Handbook</i>;</li> <li>– appropriate testing instruments.</li> </ul> </li> <li>• Following occupational health and safety rules.</li> </ul>
<b>Elements of the Competency</b> <ol style="list-style-type: none"> <li>1. To interpret the drawings and technical documentation.</li> <li>2. To adapt a process sheet to the type of machine tool used.</li> </ol>	<b>Performance Criteria</b> <ol style="list-style-type: none"> <li>1.1 Thorough reading of relevant information.</li> <li>1.2 Correct interpretation of information in French.</li> <li>2.1 Complete description of numerical control machine tools, with regard to their:             <ul style="list-style-type: none"> <li>- components;</li> <li>- kinematic chains;</li> </ul> </li> </ol>

CODE : 012V

3. To plan the work.

3.1 Detailed visual inspection of the components of the machine tool.

3.2

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
<p><b>Statement of the Competency</b> To program a machining centre manually.</p> <p><b>Elements of the Competency</b></p> <ol style="list-style-type: none"><li>1. To identify, in the drawings, process sheet and manuals, the information needed for the task.</li><li>2. To write the program.</li></ol>	<p><b>Achievement Context</b></p> <ul style="list-style-type: none"><li>• Given:<ul style="list-style-type: none"><li>- drawings of simple parts to be machined in metric or imperial units of measurement;</li><li>- process sheets;</li><li>- instructions;</li><li>- industrial numerical control machining centres or milling machines or a microcomputer with a text editor and communication software;</li><li>- a scientific calculator.</li></ul></li><li>• Using various reference materials, such as:<ul style="list-style-type: none"><li>- The Machinery's Handbook;</li><li>- tables and nomographs;</li><li>- technical manuals;</li><li>- tool catalogues;</li><li>- programming manuals.</li></ul></li><li>• Following occupational health and safety rules.</li></ul> <p><b>Performance Criteria</b></p> <ol style="list-style-type: none"><li>1.1 Thorough identification of information needed for the task.</li><li>1.2 Accurate interpretation of information.</li><li>1.3 Accurate identification of reference surfaces.</li><li>1.4 Accurate English and French terminology.</li><li>2.1 Proper choice of zero position of workpiece.</li><li>2.2 Accurate calculation of cartesian and polar coordinates, as needed.</li><li>2.3 Determination of position of beginning and end of toolpath.</li><li>2.4 Structured development of program.</li><li>2.5 Accurate insertion of machining parameters:<ul style="list-style-type: none"><li>- rpm;</li><li>- feed rate in units per minute.</li></ul></li><li>2.6 Conformity with process sheet.</li><li>2.7 Observance of programming syntax.</li></ol>

CODE : 012W

3. To edit the program using:
- a microcomputer;
  - the machine tool controller.

4. To validate the program.

- 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.

- 4.1 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
<p><b>Statement of the Competency</b> To adapt to new types of work organization.</p> <p><b>Elements of the Competency</b></p> <ol style="list-style-type: none"><li>1. To recognize the production management approaches of the company and their effects on the type of work organization.</li><li>2. To recognize the means used to promote the continual improvement of productivity.</li></ol>	<p><b>Achievement Context</b></p> <ul style="list-style-type: none"><li>• Working in a team.</li><li>• Given complete information on the operation of a manufacturing company.</li><li>• Using relevant documentation.</li><li>• In an atmosphere of respect and openness.</li></ul> <p><b>Performance Criteria</b></p> <ol style="list-style-type: none"><li>1.1 Recognition of the company's management philosophy, particularly Taylorism and added value.</li><li>1.2 Proper description of preferred type of structural organization:<ul style="list-style-type: none"><li>- hierarchical organization;</li><li>- semi-autonomous teams;</li><li>- autonomous teams.</li></ul></li><li>1.3 Recognition of the company's production process.</li><li>1.4 Appreciation of the effects of management approaches on production and on the evolution of tasks in the company.</li></ol> <ol style="list-style-type: none"><li>2.1 Accurate differentiation among the instruments or techniques used in the company.</li><li>2.2 Relevant associations between the means used and the company's ability to meet the requirements of the new economy, such as:<ul style="list-style-type: none"><li>- improvement of the time required to respond to market needs;</li><li>- economies of scale;</li><li>- elimination of waste.</li></ul></li><li>2.3 Recognition of the contribution of personnel to the improvement of productivity.</li></ol>

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



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
<b>Statement of the Competency</b>	<b>Achievement Context</b>



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





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.

CODE : 0130	
OBJECTIF	STANDARD
<p><b>Statement of the Competency</b> To modify the design concept of the components of a piece of industrial equipment.</p> <p><b>Elements of the Competency</b> 1. To analyze the specifications and sketches.</p>	<p><b>Achievement Context</b></p> <ul style="list-style-type: none"> <li>• Individually and in teams.</li> <li>• Replacing defective or inappropriate machine components.</li> <li>• For components of machines used in motion transfer.</li> <li>• Given: <ul style="list-style-type: none"> <li>- sketches of the components and specifications;</li> <li>- real parts;</li> <li>- a computerized work station connected to the information highway;</li> <li>- relevant software, including an electronic library;</li> <li>- relevant technical documentation in English and French.</li> </ul> </li> </ul> <p><b>Performance Criteria</b></p> <ol style="list-style-type: none"> <li>1.1 Accurate identification of the various components of the industrial systems involved, their functions and characteristics.</li> <li>1.2 Accurate formulation of expectations and constraints related to the need.</li> <li>1.3 Accurate reading of required performance criteria.</li> <li>1.4 Accurate formulation of the mechanical functions of the object, such as positioning, maintaining position, guiding devices, transmission and motion transfer.</li> <li>1.5 Accurate determination of the characteristic forces and movement of the object.</li> </ol> <p>1</p>

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

<p>3. To design the different parts of the tools.</p>	<p>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.</p>
<p>4. To verify the work.</p>	<p>4.1 Conformity of tool drawings with initial criteria and data. 4.2 Appropriate corrections made.</p>

CODE : 0132	
OBJECTIF	STANDARD
<p><b>Statement of the Competency</b> To keep abreast of new technologies.</p> <p><b>Elements of the Competency</b></p> <ol style="list-style-type: none"> <li>1. To research information on a given topic.</li> <li>2. To carry out a comparative study of the information gathered and present-day technologies.</li> <li>3. To determine the applications of an emerging technology.</li> </ol>	<p><b>Achievement Context</b></p> <ul style="list-style-type: none"> <li>• Individually and in teams.</li> <li>• Studying new developments and methods of processing information on materials, manufacturing processes, designing methods, fasteners, mechanisms or software applications.</li> <li>• Given: <ul style="list-style-type: none"> <li>- magazines, films, documentaries, videos, visits to companies, commercial exhibitions;</li> <li>- information networks, such as the Internet;</li> <li>- professional contacts.</li> </ul> </li> </ul> <p><b>Performance Criteria</b></p> <ol style="list-style-type: none"> <li>1.1 Observance of the procedure involved in carrying out efficient documentary research, in a library and the information highway.</li> <li>1.2 Varied sources of information.</li> <li>1.3 Proper application of efficient reading techniques to learn about new developments.</li> <li>1.4 Documented list of professional organizations and contacts in the field.</li> <li>1.5 Quality, relevance and originality of information gathered.</li> <li>1.6 Methodical archiving of the information, according to the various technological domains.</li> <li>2.1 Accurate interpretation of information in French.</li> <li>2.2 Proper understanding of the qualitative and quantitative improvements to products and production.</li> <li>2.3 Proper understanding of the economic effects of new technologies on manufacturing processes and techniques.</li> <li>2.4 Proper association made with prior knowledge.</li> <li>2.5 Thorough recording of technical characteristics.</li> <li>3.1 Relevance of applications to a manufacturing situation.</li> <li>3.2 Classification and structured archiving of information, by field of application.</li> </ol>



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 0133

CODE : 0133

3. To edit the program using:
- a microcomputer;
  - the machine tool controller.

4. To validate the program.

- 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.

- 4.1 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	
<b>HARMONIZATION</b> The content of competencies 012Y and 0134 of the present program corresponds to competency 0129 of <i>Aircraft Manufacturing Technology</i> (DEC).	
OBJECTIF	STANDARD
<p><b>Statement of the Competency</b> To develop a process sheet.</p> <p><b>Elements of the Competency</b> 1. To analyze the technical documentation.</p>	<p><b>Achievement Context</b></p> <ul style="list-style-type: none"> <li>• Developing the process sheet of a simple object, made up of several parts.</li> <li>• Given: <ul style="list-style-type: none"> <li>- specifications;</li> <li>- drawing sheets;</li> <li>- operation manuals;</li> <li>- estimates, presenting the steps in preparing the parts.</li> </ul> </li> <li>• Using: <ul style="list-style-type: none"> <li>- reference manuals;</li> <li>- catalogues;</li> <li>- tables and nomographs.</li> </ul> </li> </ul> <p><b>Performance Criteria</b></p> <ol style="list-style-type: none"> <li>1.1 Complete recording of shapes, dimensions and tolerances of the parts to be manufactured.</li> <li>1.2 Complete recording of manufacturing conditions established in the specifications, such as speed, series type and performance criteria.</li> <li>1.3 Detailed recording of the capacities of the machines in the shop, using operation manuals.</li> <li>1.4 Detailed analysis of machine running time.</li> </ol>





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	
<b>HARMONIZATION</b> This competency is equivalent to Module 8 of <i>Numerical Control Machine Tool Operation</i> (AVS). The content of competencies 012W, 0133 and 0135 of the present program corresponds to competency 011Z of <i>Aircraft Manufacturing Technology</i> (DEC).	
OBJECTIF	STANDARD
<p><b>Statement of the Competency</b> To do automatic programming.</p> <p><b>Elements of the Competency</b> 1. To identify, in the drawings, process sheet and manuals, the information needed for the task.</p>	<p><b>Achievement Context</b></p> <ul style="list-style-type: none"> <li>• Given: <ul style="list-style-type: none"> <li>- drawings of parts to be machined, requiring automatic programming in international and imperial units of measurement;</li> <li>- process sheets;</li> <li>- instructions.</li> </ul> </li> <li>• For geometric surfaces of average complexity requiring at least the programming of two-axis lathe machines and two-and-a-half-axis milling machines.</li> <li>• Using : <ul style="list-style-type: none"> <li>- a microcomputer and software for computer-assisted manufacturing (CAD/CAM), or a machine tool controller and an interactive programming language;</li> <li>- a scientific calculator.</li> </ul> </li> <li>• Using various reference materials, such as: <ul style="list-style-type: none"> <li>- <i>The Machinery's Handbook</i>;</li> <li>- tables and nomographs;</li> <li>- technical manuals;</li> <li>- tool catalogues;</li> <li>- programming manuals.</li> </ul> </li> <li>• Following occupational health and safety rules.</li> </ul> <p><b>Performance Criteria</b></p> <ol style="list-style-type: none"> <li>1.1 Thorough identification of data needed for the task.</li> <li>1.2 Accurate interpretation of information.</li> <li>1.3 Accurate identification of reference surfaces.</li> <li>1.4 Accurate English and French terminology.</li> </ol>

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.

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
<b>Statement of the Competency</b>	<b>Achievement Context</b>

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
<p><b>Statement of the Competency</b> To plan the maintenance of a machine population.</p> <p><b>Elements of the Competency</b> 1. To interpret the technical documentation.</p> <p>2. To prepare routine maintenance of the machines.</p>	<p><b>Achievement Context</b></p> <ul style="list-style-type: none"> <li>• Modifying a maintenance routine following the purchase of a new machine.</li> <li>• Given: <ul style="list-style-type: none"> <li>- operation manuals;</li> <li>- technical drawings, primary sketches, machine maintenance manuals;</li> <li>- computerized control sheets and work orders;</li> <li>- time and cost estimate tables;</li> <li>- maintenance software.</li> </ul> </li> </ul> <p><b>Performance Criteria</b></p> <p>1.1 Complete recording of machine maintenance specifications.</p> <p>1.2 Review of breakdown logs.</p> <p>1.3 Accurate interpretation of statistics related to the efficiency and frequency of use of the machines.</p> <p>1.4 Accurate interpretation of sketches and drawings.</p> <p>2.1 Proper choice of type of programs to be set up: preventive, corrective and predictive maintenance.</p> <p>2.2 Thorough planning of testing and tasks to be carried out for each machine.</p> <p>2.3 Determination of timing and frequency for appropriate control checks.</p> <p>2.4 Meticulous sequencing of tests and maintenance tasks.</p> <p>2.5 Proper justification for choices made, in</p>

CODE : 0137

3. To estimate the mechanics' workload.

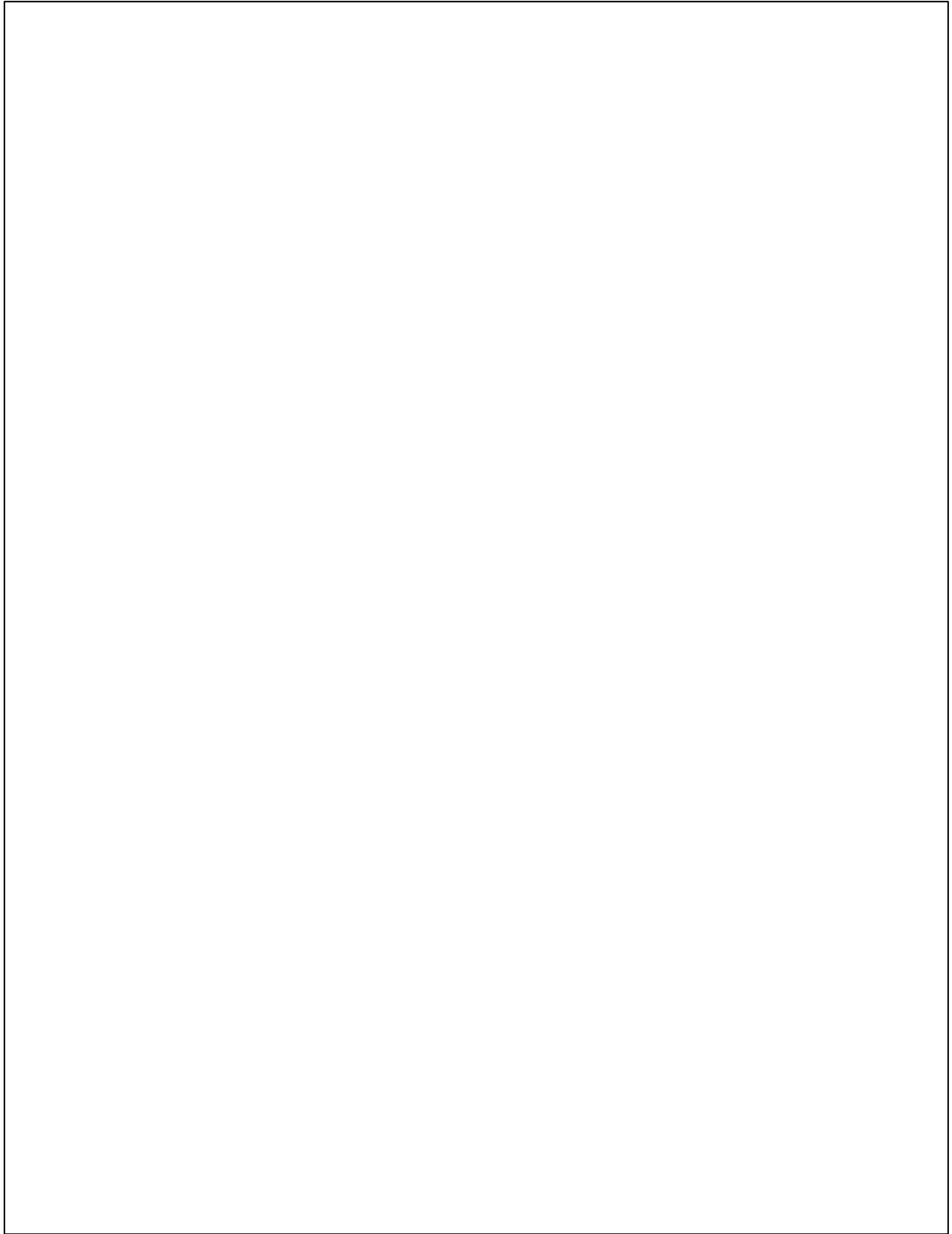
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CODE : 0138

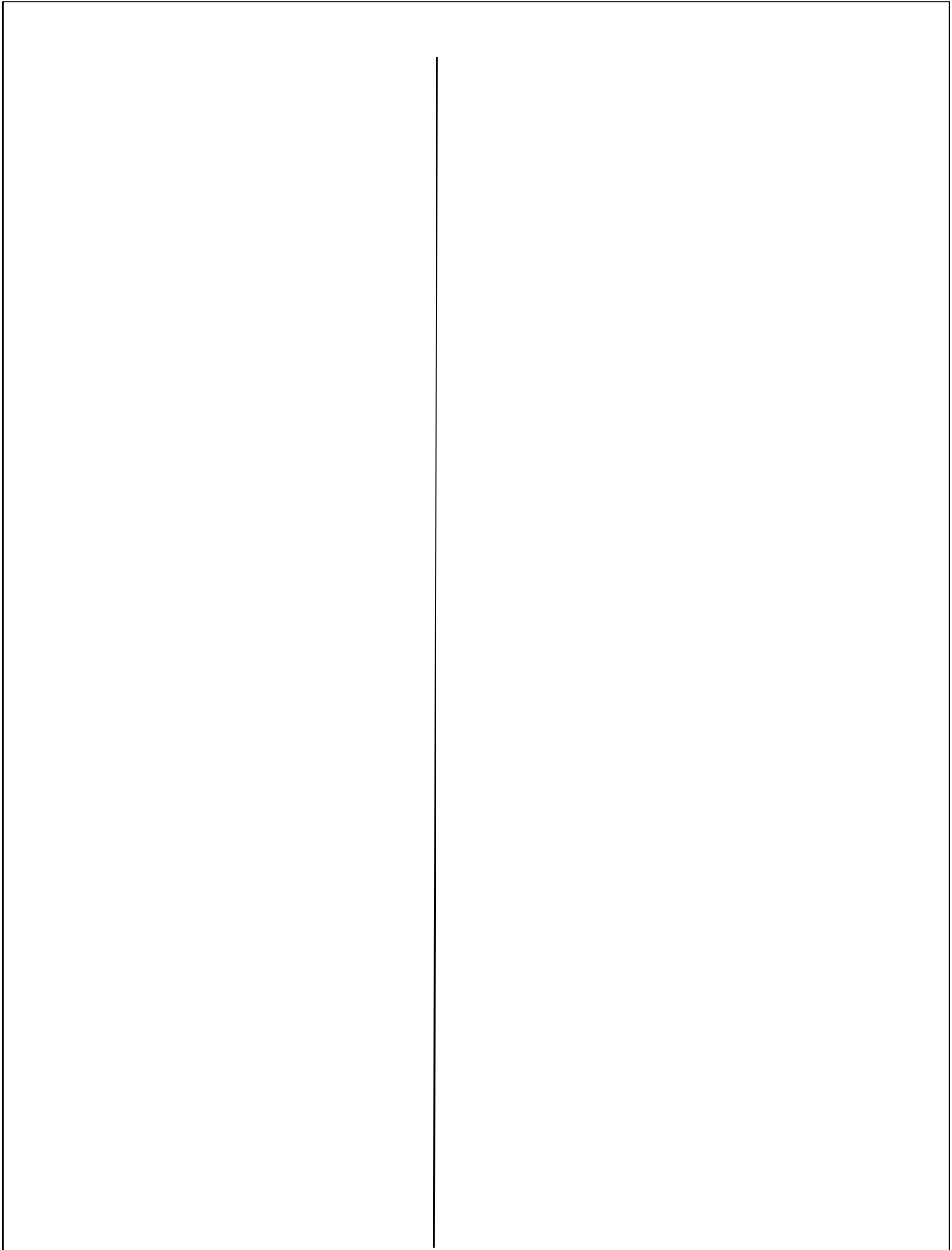
OBJECTIF

STANDARD



CODE : 0139	
OBJECTIF	STANDARD
<p><b>Statement of the Competency</b> To organize the work for a medium production run.</p> <p><b>Elements of the Competency</b></p> <ol style="list-style-type: none"> <li>1. To analyze the documents related to the project.</li>   <li>2. To estimate the resources required to create the project.</li> </ol>	<p><b>Achievement Context</b></p> <ul style="list-style-type: none"> <li>• Multidisciplinary teamwork.</li> <li>• For continuous or batch production.</li> <li>• Using drawings, specifications, estimates, process sheets and the master production schedule.</li> <li>• Given : <ul style="list-style-type: none"> <li>- planning software applications;</li> <li>- catalogues, graphics and relevant technical documentation.</li> <li>- Following occupational health and safety rules and standards.</li> </ul> </li> </ul> <p><b>Performance Criteria</b></p> <ol style="list-style-type: none"> <li>1.1 Accurate interpretation of all the documentation.</li> <li>1.2 Summary of the information contained in the master production schedule, including work organization.</li> <li>1.3 Accurate recording of production subassemblies and the necessary manufacturing procedures.</li>   <li>2.1 Accurate evaluation of the necessary materials and equipment.</li> <li>2.2 Realistic estimate of time limits.</li> <li>2.3 Accurate determination of the number of work stations needed.</li> <li>2.4 Proper use of tables to determine the number of machine- and person-hours needed.</li> <li>2.5 Accurate determination of needs exceeding normal production capacity.</li> <li>2.6 Relevant and persuasive recommendations related to use of resources.</li> </ol>





CODE : 013A

4. To launch production.

4.1 Methodical training of personnel for the tasks.

4.2 Detailed description of the health and safety of the worker (0)

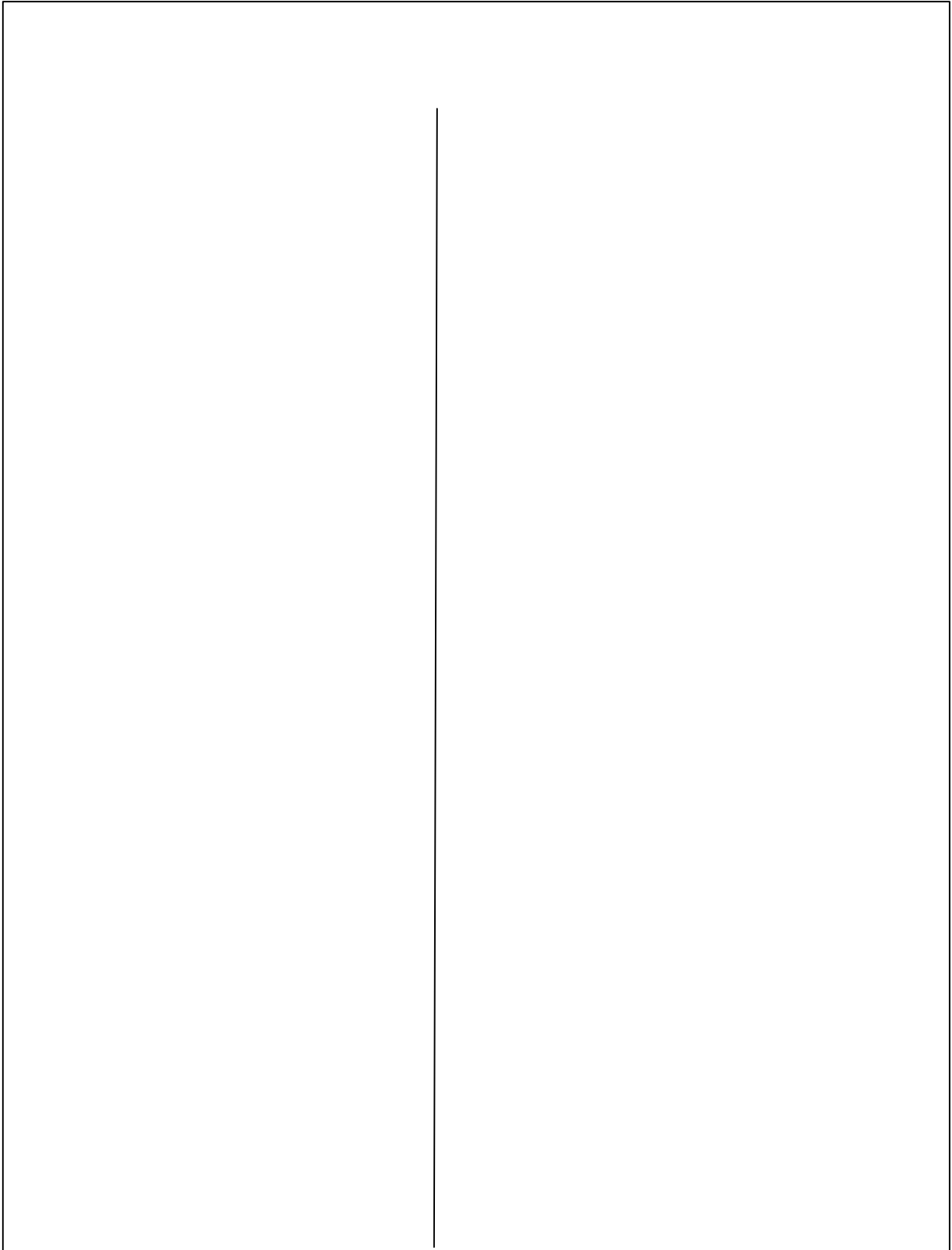


CODE : 013B	
<b>HARMONIZATION</b> This competency is equivalent to Module 16 of <i>Industrial Drafting</i> (DVS).	
OBJECTIF	STANDARD
<p><b>Statement of the Competency</b> To produce flat pattern layouts.</p> <p><b>Elements of the Competency</b></p> <ol style="list-style-type: none"> <li>1. To organize the work.</li> <li>2. To draw an orthographic projection of the object, using conventional methods.</li> <li>3. To draw the intersection of the parts.</li> <li>4. To project construction lines.</li> </ol>	<p><b>Achievement Context</b></p> <ul style="list-style-type: none"> <li>• Creating conventional and computerized drawings.</li> <li>• Developing industrial mechanical parts.</li> <li>• Using a detail drawing in English and French, as well as corresponding data.</li> <li>• Given: <ul style="list-style-type: none"> <li>– a computerized work station, with a plotter;</li> <li>– drawing or development software.</li> </ul> </li> </ul> <p><b>Performance Criteria</b></p> <ol style="list-style-type: none"> <li>1.1 Accurate interpretation of preliminary drawing and corresponding data.</li> <li>1.2 Accurate, proportional representation of the part in sketch form.</li> <li>1.3 Proper preparation of materials and work station.</li> <li>2.1 Proper layout of views.</li> <li>2.2 Conformity of drawing with data.</li> <li>2.3 Respect of dimensions.</li> <li>2.4 Clean, accurate lines.</li> <li>3.1 Respect of method of construction used to determine the intersection of the lines.</li> <li>3.2 Accurate designation of lines.</li> <li>3.3 Accurate positioning and length of construction lines.</li> <li>3.4 Conformity of drawing with construction lines.</li> <li>4.1 Respect of chosen construction method to determine the development contours of parts.</li> <li>4.2 Accurate calculations.</li> <li>4.3 Accurate determination of supplementary lengths allowed for folding thick materials.</li> <li>4.4 Accurate designation of lines of various constructions.</li> <li>4.5 Accurate positioning and length of construction lines.</li> </ol>

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

6.2

5.3 8.1



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	
<b>HARMONIZATION</b> This competency is equivalent to Module 17 of <i>Industrial Drafting</i> (DVS).	
OBJECTIF	STANDARD
<p><b>Statement of the Competency</b> To make a three-dimensional model of an object.</p> <p><b>Elements of the Competency</b></p> <ol style="list-style-type: none"> <li>1. To plan the work.</li>   <li>2. To create the parts of the object.</li>   <li>3. To assemble the parts of the object.</li>   <li>4. To do the layout.</li> </ol>	<p><b>Achievement Context</b></p> <ul style="list-style-type: none"> <li>• For the volume modeling of an object.</li> <li>• For an object comprising an assembly of parts.</li> <li>• Given an orthographic projection of a drawing or sketch.</li> <li>• Using a modeling software application.</li> </ul> <p><b>Performance Criteria</b></p> <ol style="list-style-type: none"> <li>1.1 Proper choice of method: <ul style="list-style-type: none"> <li>- basic two-dimensional shapes;</li> <li>- three-dimensional primary solids.</li> </ul> </li> <li>1.2 Proper planning of sequence of operations for constructing the three-dimensional object.</li> <li>1.3 Relevant modifications made to the variables of the layers.</li> <li>1.4 Proper proportions respected in sketches.</li>   <li>2.1 Proper fragmentation of drawing to determine shapes.</li> <li>2.2 Accurate extrusion of irregular shapes.</li> <li>2.3 Optimum use of commands for combining and subtracting.</li> <li>2.4 Relevant modifications of existing shapes: <ul style="list-style-type: none"> <li>- fillets;</li> <li>- rounds;</li> <li>- chamfers.</li> </ul> </li> <li>2.5 Proper choice of commands for modeling.</li>   <li>3.1 Proper insertion of reference files and blocks to create an exploded view.</li> <li>3.2 Respect of reference points when inserting.</li>   <li>4.1 Proper layout of drawings on the sheet.</li> <li>4.2 Proper choice of views and sections.</li> <li>4.3 Proper control of visibility of layers in the views.</li> <li>4.4 Accurate recording of dimensions on drawings.</li> <li>4.5 Proper control of visibility and density of mesh generation.</li> </ol>

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
<p><b>Statement of the Competency</b> To develop hydraulic and pneumatic circuits for industrial machines.</p> <p><b>Elements of the Competency</b></p> <ol style="list-style-type: none"> <li>To analyze the specifications and the technical documentation.</li> <li>To establish circuits' operating conditions.</li> <li>To develop basic hydraulic circuits.</li> </ol>	<p><b>Achievement Context</b></p> <ul style="list-style-type: none"> <li>In teams.</li> <li>Designing simple hydraulic and pneumatic circuits.</li> <li>Using sketches, technical drawings and data from specifications.</li> <li>Given: <ul style="list-style-type: none"> <li>catalogues and technical documentation, in English and French;</li> <li>a test stand.</li> </ul> </li> </ul> <p><b>Performance Criteria</b></p> <ol style="list-style-type: none"> <li>1.1 Accurate identification of types of required hydraulic and pneumatic circuits, their functions and characteristics.</li> <li>1.2 Recording of relevant information, such as cycle time and expected performance criteria.</li> <li>1.3 Accurate identification of expectations and constraints related to the need.</li> <li>2.1 Accurate calculation of forces involved and of operating parameters for the operations of each circuit.</li> <li>2.2 Accurate determination of basic movements and operations for each circuit.</li> <li>3.1 Proper sequence of operations for the cycle of the hydraulic circuit.</li> <li>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. pumpTD -0.e, TD 0 Tc 0.187  and flow.</li> </ol>

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
<p><b>Statement of the Competency</b> To do the engineering design of an industrial piping system.</p> <p><b>Elements of the Competency</b> 1. To analyze specifications and drawings.</p> <p>2. To plan the design.</p>	<p><b>Achievement Context</b></p> <ul style="list-style-type: none"> <li>• Designing a system comprising at least the pipe work, a pump, an electric motor, and valves and fittings.</li> <li>• Using the sketch of various components, data and specifications.</li> <li>• Given: <ul style="list-style-type: none"> <li>– time estimate tables;</li> <li>– a computerized work station connected to the information highway;</li> <li>– relevant software, including an electronic library;</li> <li>– relevant technical documentation in English and French.</li> </ul> </li> </ul> <p><b>Performance Criteria</b></p> <p>1.1 Accurate identification of expectations and constraints related to the project.</p> <p>1.2 Accurate identification of elements of the industrial context to be taken into account.</p> <p>1.3 Accurate recording of required performance criteria.</p> <p>1.4 Accurate determination of constraints to which components are submitted.</p> <p>2.1 Due consideration given to problem-solving strategies.</p> <p>2.2 Realistic estimate of tasks to be performed and time limits.</p> <p>2.3 Efficient search for commercially available components.</p> <p>2.4 Structured archiving of data.</p> <p>2.5 Realistic estimate of the time required to complete the design, using tables.</p> <p>2.6 Accurate recording of measurements.</p>

CODE

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

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 To validate the design with
4TD -0.1474162.75 TD do4.4 parties.	

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
<p><b>Statement of the Competency</b> To do the engineering design of machine housings.</p> <p><b>Elements of the Competency</b></p> <ol style="list-style-type: none"> <li>1. To plan the work.</li> <li>2. To take measurements.</li> <li>3. To determine the admissible loads for the structure.</li> </ol>	<p><b>Achievement Context</b></p> <ul style="list-style-type: none"> <li>• Designing the structures and supports for simple industrial machine housings.</li> <li>• Using sketches of various components and data given in the specifications.</li> <li>• Given: <ul style="list-style-type: none"> <li>– a computerized work station connected to the information highway;</li> <li>– relevant software, including an electronic library;</li> <li>– relevant technical documentation in English and French;</li> <li>– relevant measurement instruments.</li> </ul> </li> </ul> <p><b>Performance Criteria</b></p> <ol style="list-style-type: none"> <li>1.1 Thorough analysis of specifications and technical documentation of the project.</li> <li>1.2 Accurate determination of expectations and constraints related to need.</li> <li>1.3 Accurate recording of general parameters of the project.</li> <li>1.4 Realistic determination of work plan and time limits.</li> <li>2.1 Verification of conformity of measurements taken with data given in the specifications.</li> <li>2.2 Complete recording of data.</li> <li>2.3 Accurate determination of health and safety rules, when visiting a work site.</li> <li>3.1 Accurate determination of the characteristics of the structures to be respected and the forces exerted.</li> <li>3.2 Accurate calculation of conditions of equilibrium, keeping in mind the principles of physics.</li> <li>3.3 Accurate calculation of resistance, rigidity and stability of frames.</li> </ol>

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

CODE : 013J

OBJECTIF

STANDARD

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

CODE : 013K	
OBJECTIF	STANDARD
<p><b>Statement of the Competency</b> To automate an industrial system.</p> <p><b>Elements of the Competency</b></p> <ol style="list-style-type: none"> <li>To analyze the specifications and the documentation related to the project.</li> </ol>	<p><b>Achievement Context</b></p> <ul style="list-style-type: none"> <li>In teams.</li> <li>For a work station or a simple machine.</li> <li>Given: <ul style="list-style-type: none"> <li>specifications;</li> <li>sketches and technical drawings;</li> <li>a computerized work station connected to the information highway;</li> <li>relevant software;</li> <li>relevant technical documentation in English and French.</li> </ul> </li> </ul> <p><b>Performance Criteria</b></p> <ol style="list-style-type: none"> <li>1.1 Accurate determination of expectations and constraints related to automating a system.</li> <li>1.2 Accurate identification of the general parameters</li> </ol>

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

CODE : 013L	
OBJECTIF	STANDARD
<p><b>Statement of the Competency</b> To coordinate a design project.</p> <p><b>Elements of the Competency</b> 1. To analyze the project's specifications and technical documentation.</p>	<p><b>Achievement Context</b></p> <ul style="list-style-type: none"> <li>• In teams.</li> <li>• Modifying a design project for an existing system.</li> <li>• For a mechanical system integrating various types of circuits, such as hydraulic, pneumatic, electric and automated.</li> <li>• Given: <ul style="list-style-type: none"> <li>– a computerized work station connected to the information highway;</li> <li>– relevant software, including an electronic library;</li> <li>– relevant technical documentation in English and French.</li> </ul> </li> <li>• In a context characterized by the integration of new workplace methods.</li> </ul> <p><b>Performance Criteria</b></p> <ol style="list-style-type: none"> <li>1.1 Accurate interpretation of drawings and technical information.</li> <li>1.2 Accurate interpretation of electric and electronic diagrams.</li> <li>1.3 Accurate determination of expectations and constraints related to the modifications to be made to the system.</li> <li>1.4 Accurate identification of general parameters of the system.</li> <li>1.5 Accurate determination of the technological</li> </ol>

CODE : 013L	
<p>3. To plan the work.</p>	<p>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.</p>
<p>4. To verify the quality of the modifications made to the system.</p>	<p>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.</p>
<p>5. To verify the quality of the design drawings.</p>	<p>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.</p>



CODE : 013L	
<p>6. To write out an estimate.</p>	<p>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.</p>
<p>7. To process tenders.</p>	<p>7.1 Clearly written call for tenders.          7.2 Thorough analysis of tenders.</p>

Clearly written call for tenders7 . 4



## **EDUCATIONAL INTENTIONS OF GENERAL EDUCATION**

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### **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.

## 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

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*

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