



Québec 🔠



Formation professionnelle et technique et formation continue

> Direction générale des programmes et du développement

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#### INTRODUCTION

The *Cable and Circuit Assembly* program was designed on the basis of a framework for developing vocational education programs that calls for the participation of experts from the workplace and the field of education.

The program of study is developed in terms of competencies, expressed as objectives. These objectives are divided into modules. Various factors were kept in mind in developing the program: training needs, the job situation, purposes, goals, and strategies and means used to attain objectives.

The program of study lists the competencies that are the minimum requirements for a **Diploma of Vocational Studies (DVS)**, for students in both the youth and adult sectors. It also provides the basis for organizing courses, planning teaching strategies, and designing instructional and evaluation materials.

The *Cable and Circuit Assembly* program leads to the Diploma of Vocational Studies. To be admitted to the program, students must meet one of the following conditions:

• For students holding a Secondary School Diploma or a recognized equivalent, no additional conditions are required.

OR

• For students who are at least 16 years of age on September 30 of the school year in which they begin the program, the following condition applies: they must have obtained Secondary IV credits in language of instruction, second language and mathematics or the recognized equivalents.

OR

• For students who are at least 18 years of age, successful completion of the General Development Test.

#### OR

• For students having obtained Secondary III credits in language of instruction, second language and mathematics in programs established by the Minister, general education is required in conjunction with vocational education in order to obtain the following credits, if applicable: Secondary IV language of instruction, second language and mathematics in programs established by the Minister.

The program of study is divided into 16 modules which vary in length from 15 to 120 hours (multiples of 15). The common core is made up of 11 modules and there are five modules each for both the aerospace and optics-photonics fields.

In aerospace, 450 hours are spent on the specific competencies required to practise the trade and 495 hours, on general competencies.

In optics-photonics, 435 hours are spent on the specific competencies required to practise the trade and 510 hours, on general competencies.

In both cases, the time allocated to the program is to be used not only for teaching but also for evaluation and remedial work.

The document contains two parts. Part I is of general interest and provides an overview of the training plan. It includes a synoptic table of the basic information about the modules, a description of the program training goals, the competencies to be developed and the general objectives, an explanation of operational objectives and a section on harmonization. Part II is designed primarily for those directly involved in implementing the program. It contains a description of the operational objectives of each module. It also contains suggestions on the instructional approach and related content for each module in the program. The suggestions are provided for informational purposes only, while the operational objectives are compulsory.

#### **Program Training Goals**

Statements that describe the educational aims of a program. These goals are the general goals of vocational education adapted to a specific trade or occupation.

#### Competency

A set of socioaffective behaviours, cognitive skills or psychosensorimotor skills that enable a person to correctly perform a role, function, activity or task.

#### **General Objectives**

Instructional objectives that provide an orientation for leading the students to attain one or more related objectives.

#### **Operational Objectives**

Statements of the educational aims of a program in practical terms. They serve as the basis for teaching, learning and evaluation.

#### Module of a Program

A component part of a program of study comprising a first-level operational objective and the related second-level operational objectives.

#### Credit

A unit used for expressing quantitatively the value of the modules in a program of study. One credit corresponds to 15 hours of training. Students must accumulate a set number of credits to graduate from a program.

# Part I

## 1 SYNOPTIC TABLE

## Cable and Circuit Assembly

Program code: 5769

	Aerospace	Optics- photonics
Number of modules:	16	16
Duration in hours:	945	945
Credits:	63	63

CODE	MODULE NO.	TITLE OF THE MODULE	HOURS	CREDITS*
		Common Core		
797 951	1	The Trade and the Training Process	15	1
869 064	10	Work Procedures and Computers	60	4
869 223	11	Manual Machining and Mechanical Assembly	45	3
797 964	12	Preparing Wires and Cables	60	4
869 255	13	Soldering	75	5
797 976	14	Building Harnesses	90	6
797 985	15	Assembling and Installing System Components	75	5
797 995	16	Installing Harnesses	75	5
798 005	17	Assembling Printed Circuit Boards	75	5
869 201	20	Job Search Techniques	15	1
869 224	21	Practicum in the Workplace	60	4
		Aerospace		
869 022	2	Evolution of the Aerospace Industry	30	2
869 044	3	Reading Drawings and Manuals	60	4
869 083	4	Occupational Health and Safety and Materials Handling	45	3
869 236	5	Concepts of Electricity	90	6
869 295	18	Maintaining an Electrical System	75	5
		Optics-Photonics		
798 013	6	Reading Drawings and Manuals	45	3
798 022	7	Occupational Health and Safety	30	2
798 038	8	Analysis of the Operation of an Optics-Photonics Circuit	120	8
872 153	9	New Types of Work Organization	45	3
798 044	19	Performing Minor Maintenance Operations on an Optics- Photonics System	60	4

\* 15 hours = 1 credit

## 2 PROGRAM TRAINING GOALS

The training goals of the *Cable and Circuit Assembly* program are based on the general goals of vocational education and take into account the specific nature of the trade or occupation. These goals are:

#### To develop effectiveness in the practice of a trade.

- To teach students to perform cable and circuit assembly tasks and activities correctly, at an acceptable level of competence for entry into the job market.
- To prepare students to progress satisfactorily on the job by fostering:
  - the intellectual skills required to interpret task-related standards and work methods and to understand the principles underlying electricity or optics, depending on the path chosen
  - the psychomotor skills required to perform machining, mechanical assembly, wire and cable preparation and soldering tasks
  - work habits favouring health and safety
  - a concern for effective communication with superiors and colleagues
  - attentiveness and precision in the performance of various tasks
  - order, neatness and speed in carrying out different activities
  - a concern for total quality

#### To ensure integration into the job market.

- To help students learn about their rights and responsibilities as workers.
- To help students learn about the job market in cable and circuit assembly in general and in aerospace or photonics in particular.
- To familiarize students with the new types of work organization.
- To familiarize students with the trade by allowing them to enter the workplace.

#### To foster personal development and the acquisition of trade-related knowledge.

- To foster independence, a sense of responsibility and a desire to succeed.
- To help students understand the principles underlying the different tasks involved in cable and circuit assembly in aerospace or photonics.
- To help students develop the habit of inspecting and correcting their work.
- To help students develop work methods and a sense of discipline.

#### To ensure job mobility.

- To help students acquire a solid basic education.
- To help students develop positive attitudes toward technological change and new situations.
- To help students learn how to learn.
- To help students prepare for a creative job search.

#### **3 COMPETENCIES**

The competencies to be developed in the *Cable and Circuit Assembly* program are shown in the grid of learning focuses on the following page. The grid lists general and specific competencies as well as the major steps in the work process.

General competencies involve activities common to several tasks or situations. They cover, for example, the technological or scientific principles that the students must understand to practise the trade or occupation. Specific competencies focus on tasks and activities that are of direct use in the trade or occupation. The work process includes the most important steps in carrying out the tasks and activities of the trade or occupation.

The grid of learning focuses shows the relationship between the general competencies on the horizontal axis and the specific competencies on the vertical axis. The symbol ( $\triangle$ ) indicates a correlation between a specific competency and a step in the work process. The symbol (O) indicates a correlation between a general and a specific competency. Shaded symbols indicate that these relationships have been taken into account in the formulation of objectives intended to develop specific competencies related to the trade or occupation.

The logic used in constructing the grid influences the course sequence. Generally speaking, this sequence follows a logical progression in terms of the complexity of the learning involved and the development of the students' autonomy. The vertical axis of the grid shows the competencies directly related to the practice of a specific trade or occupation. These competencies are arranged in a relatively fixed order; therefore, the modules should be taught, insofar as possible, in the order represented on the grid. The modules including the general competencies on the horizontal axis should be taught in relation to those on the vertical axis. This means that some modules are prerequisite to others, while other modules are taught concurrently.

	GRID OF LEARNING FOCUSES		WORK PROCESS (major steps)				GENERAL COMPETENCIES (related to technology, subjects, personal development, etc.)									TOTALS									
CABLE AND CIRCUIT ASSEMBLY SPECIFIC COMPETENCIES (directly related to the practice of the specific occupation)		OPERATIONAL OBJECTIVES	DURATION (IN HOURS)	Be familiar with instructions, drawings, work procedures and standards	Plan the work and set up the workstation	Do the work	Check the work	Tidy up	Determine their suitability for the trade and the training process	Gain an overview of the evolution of the aerospace industry	Interpret drawings, diagrams and manuals, and produce sketches	Apply occupational health and safety rules and materials handling techniques	Apply concepts and techniques related to electricity	Interpret drawings, diagrams and manuals	Prevent occupational health and safety risks	Analyze the operation of an optics- photonics circuit and its components	Adapt to new types of work organization	Apply various work procedures and use computer hardware	Perform manual machining and mechanical assembly tasks	Prepare wires and cables	Perform soldering operations	Use job search techniques	NUMBER OF OBJECTIVES	DURATION (IN HOURS)	DURATION (IN HOURS)
ES	MODULES								1	2	3	4	5	6	7	8	9	10	11	12	13	20			
DUL	OPERATIONAL OBJECTIVES								S	S	В	В	В	В	В	В	В	В	В	В	В	S	10		
M	DURATION (IN HOURS)								15	30	60	45	90	45	30	120	45	60	45	60	75	15		495	510
14	Build harnesses	В	90						0	0	٠	•	•	•	•	•	٠	•	•	۲	٠				
15	Assemble and install system components	В	75						о	0	•	•	•	•	•	•	•	•	•	•	●				
16	Install harnesses in an assembly	В	75						0	0	۲	•	•	٠	•	•	٠	•	•	۲	۲				
17	Assemble printed circuit boards	В	75						0	0	•	•	0	•	•	0	•	•	0	٠	•				
18	Maintain an electrical system	В	75						0	0	•	•	•					٠	•	٠	•				
19	Perform minor maintenance operations on the components of an optics-photonics system	В	60						0					•	•	•	٠	•	•						
21	Enter the work force	S	60	Δ	Δ	Δ	Δ	Δ	0	0	0	0	0	0	0	0	0	0	0	0	0	•			
NUM	BER OF OBJECTIVES	6																					16		
DUR/	ATION (IN HOURS)		450																					945	
DURATION (IN HOURS)			435																						945

B: Behavioural

S: Situational

 $\Delta$  Correlation between a step and a specific competency

Correlation to be taught and evaluated

O Correlation between a general and a specific competencyCorrelation to be taught and evaluated

### 4 GENERAL OBJECTIVES

The general objectives of the *Cable and Circuit Assembly* program are presented below, along with the major statement of each corresponding first-level objective.

## To develop in the students the competencies required to integrate harmoniously into the school and work environments.

- Determine their suitability for the trade and the training process.
- Prevent occupational health and safety risks in aerospace and photonics.
- Gain an overview of the evolution of the aerospace industry.
- Adapt to new types of work organization (optics-photonics).
- Use job search techniques.
- Enter the work force (aerospace and optics-photonics).

#### To develop in the students the competencies required to perform basic trade-related tasks.

- Interpret drawings, diagrams and manuals.
- Produce sketches (aerospace).
- Apply various work procedures.
- Use computer hardware.
- Perform manual machining and mechanical assembly tasks.
- Apply materials handling techniques (aerospace).
- Apply concepts and techniques related to electricity (aerospace).
- Analyze the operation of an optics-photonics circuit and its components (optics-photonics).
- Prepare wires and cables.
- Perform soldering operations.

## To develop in the students the competencies required to perform specialized trade-related tasks.

- Build harnesses.
- Assemble and install system components.
- Install harnesses in an assembly.

#### To develop in the students the competencies required to perform complementary tasks.

- Assemble printed circuit boards.
- Maintain an electrical system (aerospace).
- Perform minor maintenance operations on the components of an optics-photonics system.

#### 5 FIRST- AND SECOND-LEVEL OPERATIONAL OBJECTIVES

#### 5.1 DEFINITION

A first-level objective is defined for each competency to be developed. Competencies are organized into an integrated training program designed to prepare students to practise the trade or occupation. This systematic organization of competencies produces better overall results than training by isolated objectives. More specifically, it fosters a smooth progression from one objective to the next, saves teaching time by eliminating needless repetition, and integrates and reinforces learning material.

**First-level operational objectives** are the main, compulsory teaching/learning targets and they are specifically evaluated for certification. There are two kinds of operational objectives: behavioural and situational.

- A **behavioural objective** is a relatively closed objective that describes the actions and results expected of the student by the end of a learning step. Evaluation is based on expected results.
- A situational objective is a relatively open-ended objective that outlines the major phases of a learning situation. It allows for output and results to vary from one student to another. Evaluation is based on the student's participation in the activities of the learning context.

**Second-level operational objectives** are intermediate teaching/learning targets deemed prerequisite for attaining first-level objectives. They are grouped according to the specifications (see 5.2.1) or the phases (see 5.2.2) of the first-level objective.

The division of operational objectives into first- and second-level objectives is based on a clear distinction between the levels of learning:

- learning involving prerequisite knowledge
- learning involving competencies

Second-level operational objectives indicate prerequisite knowledge. They prepare the students to learn what is necessary to attain the first-level operational objectives, which collectively lead to the development of a competency. The objectives should always be adapted to meet the particular needs of the individual students or groups of students.

First-level operational objectives cover the learning that the students need to develop a competency:

• The **specifications** or the **phases** of the objective determine or guide specific learning, thereby allowing the competency to be developed step by step.

- The objective as a whole (i.e. the six components and in particular the last phase of a situational objective) determines or guides the overall learning and the integration and synthesis of this learning, allowing the competency to be developed fully.

To attain the objectives, the following learning activities may be prepared:

- specific learning activities for second-level objectives
- specific learning activities for the specifications or phases of first-level objectives
- general learning activities for first-level objectives

#### 5.2 HOW TO READ FIRST-LEVEL OPERATIONAL OBJECTIVES

#### 5.2.1 How to Read a Behavioural Objective

Behavioural objectives consist of five components, described in the first two columns. The first two provide an overview of the objective:

- The **expected behaviour** states a competency in terms of the general behaviour that the students are expected to have acquired by the end of the module.
- The **conditions for performance evaluation** define what is necessary or permissible to the students during evaluation designed to verify whether or not the students have attained the objective. This means that the conditions for evaluation are the same wherever and whenever the program is taught.

The last three components ensure that the objective is understood clearly and unequivocally:

- The **specifications of the expected behaviour** describe the essential elements of the competency in terms of specific behaviours.
- The **specific performance criteria** define the requirements for each of the specifications of behaviour. They ensure a more enlightened decision on the attainment of the objective.
- The **field of application** defines the limits of the objective, where necessary. It indicates cases where the objective applies to more than one task, occupation or field.

The third column, **Suggested Approach/Related Content**, gives additional information about the learning activities, to be used at the instructor's discretion. It is important to note that establishments must continuously update this information in order to keep up with the changes in the job market.

### 5.2.2 How to Read a Situational Objective

Situational objectives consist of six compulsory components described in the first two columns:

- The **expected outcome** states a competency as an aim to be pursued throughout the course.
- The **specifications** outline the essential aspects of the competency and ensure a better understanding of the expected outcome.
- The **learning context** provides an outline of the learning situation designed to help the students develop the required competencies. It is normally divided into three phases of learning:
  - information
  - performance, practice or involvement
  - synthesis, integration and self-evaluation
- The **instructional guidelines** provide suggested ways and means of teaching the course to ensure that learning takes place and that the same conditions apply wherever and whenever the course is taught. These guidelines may include general principles or specific procedures.
- The **participation criteria** describe the requirements the students must fulfill, which are usually related to each phase of the learning context. They focus on how the students take part in the activities rather than on the results obtained. Participation criteria are normally provided for each phase of the learning context.
- The **field of application** defines the limits of the objective, where necessary. It indicates cases where the objective applies to more than one task, occupation or field.

The third column, **Suggested Approach/Related Content**, gives additional information about the learning activities, to be used at the instructor's discretion. It is important to note that establishments must continuously update this information in order to keep up with the evolution of the job market.

#### 6 HARMONIZATION

*Cable and Circuit Assembly* (5769) was designed and developed as part of a project to harmonize vocational education programs. The objective of harmonization is to optimize the efforts of students during training, by making it easier to switch from one program to another or from one level of instruction to another while avoiding the duplication of learning.

The *Cable and Circuit Assembly, Aircraft Mechanical Assembly* and *Aircraft Structural Assembly* programs are made up of a common core of modules, as illustrated in the following table.

	Cable and Circuit Assembly 5769	Aircraft Mechanical Assembly 5699	Aircraft Structural Assembly 5697
869 022 Evolution of the Aerospace Industry	yes	yes	yes
869 064 Work Procedures and Computers	yes	yes	yes
869 083 Occupational Health and Safety and Materials Handling	yes	yes	yes
869 201 Job Search Techniques	yes	yes	yes

The *Cable and Circuit Assembly* program also contains a course shared with the *Industrial Drafting*, *Machining Techniques* and *Numerical Control Machine Tool Operation* programs. The following table illustrates the fact that the module entitled "New Types of Work Organization" is included in all four programs.

		Cable and Circuit Assembly 5769	Machining Techniques 5723	Numerical Control Machine Tool Operation 5724	Industrial Drafting 5725
872 153	New Types of Work Organization	yes	yes	yes	yes

# Part II

MODULE 1: THE TRADE AND THE TRA	CODE: 797 951 15 hours				
Expected Outcome	Instructional Guidelines	Suggested Approach			
By participating in the required activities of the learning context according to the indicated criteria, the students will be able to determine their suitability for the trade and the training process. Specifications: Be familiar with the nature of the trade. Understand the training process. Confirm their career choice.	<ul> <li>Create in the classroom a climate that is conducive to students' integration in the school.</li> <li>Encourage the students to engage in discussions and to express themselves.</li> <li>Motivate the students to take part in the suggested activities.</li> <li>Help the students acquire an accurate perception of the trade.</li> <li>Provide the students with the means of assessing their career choice honestly and objectively.</li> <li>Organize field trips to companies that are representative of the main work environments in the trade.</li> <li>Make available all pertinent documentation.</li> <li>Organize a meeting with specialists in the trade.</li> <li>Provide a report outline.</li> </ul>	<ul> <li>Distinguish between situational and behavioural objectives.</li> <li>Prepare an observation checklist in order to gather information for the evaluation of the students' participation.</li> </ul>			

	Learning Context (first- and second-level operational objectives)	Participation Criteria	Suggested Related Content
	PHASE 1 Information on the Trade		
1	Be receptive to information about the trade and the training program.		<ul> <li>Conditions of receptivity:</li> <li>visual and auditory attention</li> <li>favourable climate</li> <li>interest</li> <li>concentration</li> <li>physical and psychological well-being</li> </ul>
2	Be willing to share their views on the trade with other members of the group.		• Advantages of sharing their views and listening to those of others
3	Find information.		<ul> <li>Identification of information sought</li> <li>Preparation for the identification of important points</li> <li>Concentration on points selected</li> <li>Recording of these points</li> </ul>
4	Determine how to record and present information.		
5	Give the meaning of "entry-level qualifications."		<ul> <li>Requirements for obtaining a job, such as:</li> <li>Diploma of Vocational Studies and the associated competencies</li> <li>practice period in order to attain the speed required in the industry</li> <li>Knowledge of basic rules: participation</li> </ul>

	Learning Context (first- and second-level operational objectives)	Participation Criteria	Suggested Related Content
6	Explain the main rules governing group discussion.		<ul> <li>Speaking in turn</li> <li>Sticking to the topic</li> <li>Listening to others</li> <li>Accepting that others have different points of view</li> <li>Qualities of message</li> </ul>
A	Learning about the job market in cable and circuit assembly.	• Gather information on the types of companies in which the trade is practised, the type of work and the types of jobs and their requirements.	<ul> <li>Types of aerospace or photonics companies</li> <li>Socioeconomic sectors of activity</li> <li>Job prospects</li> <li>Remuneration</li> <li>Promotion and transfer</li> <li>Selection of candidates</li> </ul>
В	Learning about the nature and requirements of the job.		<ul> <li>Employment situation: job prospects, remuneration, possibilities for promotion, etc.</li> <li>Trade-related tasks and their importance and complexity</li> <li>Necessary knowledge and skills</li> <li>Working conditions</li> </ul>
C	Presenting the information gathered and discussing their views on the trade.	• Express their views on the trade in a group meeting, relating them to the information they have gathered.	<ul> <li>Concise presentation of information gathered</li> <li>Advantages, disadvantages and requirements</li> </ul>

Learning Context (first- and second-level operational objectives)	Participation Criteria	Suggested Related Content
PHASE 2         Information on and         Participation in the Training         Program         7       Define the terms "skill,"         "aptitude," "attitude," "attitude," and         "knowledge."		<ul> <li>Simple definitions:         <ul> <li>Skill: ability to reproduce a behaviour</li> <li>Aptitude: natural ability</li> <li>Attitude: ability to react positively or negatively to objects or situations</li> <li>Knowledge: idea, notion, understanding</li> </ul> </li> </ul>
<ul> <li>D Discussing the skills, aptitudes and knowledge required to practise the trade.</li> <li>8 Describe the nature and purpose of a program of study.</li> </ul>		<ul> <li>Nature: official document (regulation) produced by the Ministère de l'Éducation</li> <li>Purpose: reference material for teaching, learning, evaluation and the certification of studies</li> </ul>
E Learning about the program of study and the training process.	• Thoroughly study the relevant documents.	<ul> <li>Study of document (program of study), and in particular: <ul> <li>the synoptic table</li> <li>the training goals</li> <li>the general objectives</li> <li>the first-level operational objectives</li> </ul> </li> <li>Collection of information about: <ul> <li>evaluation</li> <li>the certification of studies</li> <li>the learning process</li> <li>the organization of modules</li> </ul> </li> <li>Specific characteristics of the <i>aerospace</i> and <i>optics-photonics</i> paths</li> </ul>

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Module 1
Learning Context (first- and second-level operational objectives)	Participation Criteria	Suggested Related Content
F Discussing the relevance of the program to the work environment of cable and circuit assemblers.	• Give their opinions on some of the requirements that they will have to meet in order to practise the trade.	
G Discussing their initial reactions to the trade and the training program.	• Express their views on the training program appropriately in a group meeting.	

PHASE 3       Evaluation and Confirmation of Career Choice       9     Differentiate among preferences, aptitudes and expectations.       10     Describe the main components of the report confirming their career choice.	Learning Context (first- and second-level operational objectives)	Participation Criteria	Suggested Related Content
<ul> <li>H Stating their preferences, aptitudes and expectations with respect to the trade.</li> <li>I Assessing their career choice by comparing the requirements of the trade with their own preferences, aptitudes and expectations.</li> <li>J Presenting the result of their assessment in a report.</li> <li>Write a report that: <ul> <li>sums up their preferences and aptitudes</li> <li>explains how they arrived at their choice to continue in or withdraw from the program</li> </ul> </li> <li>Determination of what they would like to do and assessment of their chances of doing it Summary of their preferences, aptitudes and expectations.</li> </ul>	<ul> <li>(first- and second-level operational objectives)</li> <li>PHASE 3 Evaluation and Confirmation of Career Choice</li> <li>9 Differentiate among preferences, aptitudes and expectations.</li> <li>10 Describe the main components of the report confirming their career choice.</li> <li>H Stating their preferences, aptitudes and expectations with respect to the trade.</li> <li>I Assessing their career choice by comparing the requirements of the trade with their own preferences, aptitudes and expectations.</li> <li>J Presenting the result of their assessment in a report.</li> </ul>	<ul> <li>Write a report that:</li> <li>sums up their preferences and aptitudes</li> <li>explains how they arrived at their choice to continue in or withdraw from the program</li> </ul>	<ul> <li>Determination of what they would like to do and assessment of their chances of doing it</li> <li>Summary of their preferences, aptitudes and expectations</li> <li>Summary of the requirements of the trade</li> <li>Parallels between the two above aspects</li> <li>Brief conclusion explaining their career choice</li> </ul>

MODULE 2: EVOLUTION OF THE AER	OSPACE INDUSTRY	CODE: 869 022 30 hours
Expected Outcome	Instructional Guidelines	Suggested Approach
<ul> <li>By participating in the required activities of the learning context according to the indicated criteria, the students will be able to gain an overview of the evolution of the aerospace industry.</li> <li>Specifications: <ul> <li>Be familiar with the main events in the history of the aerospace industry.</li> <li>Be familiar with the role of the aerospace industry in the economies of Québec and Canada, as well as in the global market.</li> <li>Understand the impact of technological development and the globalization of markets on productivity and competitiveness in the aerospace industry.</li> <li>Be familiar with the quality standards associated with the aerospace industry.</li> </ul> </li> </ul>	<ul> <li>Kindle an interest in the history and evolution of the aerospace industry.</li> <li>Create a climate that is conducive to research and reflection.</li> <li>Make available all the necessary documentation.</li> <li>Encourage the students to engage in discussions and to express themselves.</li> <li>Underline the need for workers in the aerospace industry to adopt new ways of thinking.</li> <li>Provide a report outline.</li> </ul>	<ul> <li>Prepare an evaluation checklist in order to gather information for the evaluation of students' participation.</li> <li>View a film on the history of aviation.</li> <li>Do research using the Internet.</li> <li>Prepare a presentation illustrating the evolution of an aerospace-related product, taking into account its origin, the current reality and the foreseeable future.</li> </ul>

	Learning Context (first- and second-level operational objectives)	Participation Criteria	Suggested Related Content
	PHASE 1 Information on the Evolution of the Aerospace Industry		
1	Be open to new knowledge.		<ul> <li>Learning methods:</li> <li>personal preferences</li> <li>exploration and planning of learning</li> </ul>
2	Adopt a research method.		<ul> <li>Different references</li> <li>Classification of information</li> </ul>
3	Recognize the main Québec and Canadian companies that build aircraft.		<ul> <li>Cursory analysis of sources</li> <li>Criteria and methods of selecting information by area of interest</li> <li>Methods of researching directories, product directories, government and corporate publications, and agencies for economic and sectorial promotion: <ul> <li>companies</li> <li>type of production, volume</li> <li>location</li> <li>number of employees per job category</li> </ul> </li> </ul>
4	Define the concepts of productivity, competitiveness and total quality.		<ul> <li>Productivity: quantity of production units in relation to the methods used (equipment, raw materials)</li> <li>Competitiveness: ability to endure competition in a given production category</li> <li>Quality: a company's ability to perfectly meet the requirements of a client for a given product at a lower cost</li> </ul>

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Learning Context (first- and second-level operational objectives)	Participation Criteria	Suggested Related Content
A Learning about the major events in the history of the aerospace industry.	• Gather information on most of the topics to be dealt with.	• Locate in publications information about the events and periods in the history of the aerospace industry, from the Wright brothers to today.
B Learning about the current aerospace markets and the role of the industry in the Québec, Canadian and world economies.		<ul> <li>Major markets: <ul> <li>large carriers</li> <li>regional carriers</li> <li>business aircraft</li> <li>private aircraft</li> <li>military aircraft</li> <li>transport helicopters</li> <li>spacecraft</li> <li>flight simulators</li> <li>etc.</li> </ul> </li> <li>Production volume in dollars</li> <li>Jobs</li> <li>Subcontracting</li> <li>Economic impact</li> <li>Economic spinoffs</li> <li>Québec's contribution to Canadian and world production</li> </ul>

Learning Context (first- and second-level operational objectives)	Participation Criteria	Suggested Related Content
C Learning about the development of new aerospace technologies and identifying their impact on other sectors of activity.		<ul> <li>New technologies related to:</li> <li>materials (new alloys, composites, etc.)</li> <li>fibre optics</li> <li>electronic instruments</li> <li>communications equipment</li> <li>monitoring systems</li> <li>miniaturization of equipment</li> <li>construction technologies</li> <li>aerodynamics</li> <li>design software</li> <li>tests</li> <li>etc.</li> </ul>

Learning Context (first- and second-level operational objectives)	Participation Criteria	Suggested Related Content
D Learning about market globalization and its impact on competitiveness and productivity in the industry.		<ul> <li>Impact on: <ul> <li>assembly and forming techniques</li> <li>telecommunications systems</li> <li>manufacturing processes for different composite products</li> <li>insulators</li> <li>research and development</li> <li>etc.</li> </ul> </li> <li>Rationalization of production: <ul> <li>specialization</li> <li>investment</li> <li>subcontracting</li> <li>etc.</li> </ul> </li> <li>Research and development</li> <li>Reengineering</li> <li>Modernization</li> <li>Equipment using new technologies</li> <li>Labour relations</li> <li>In-service training</li> </ul>

Learning Context (first- and second-level operational objectives)	Participation Criteria	Suggested Related Content
E Learning about military and nonmilitary quality standards and certification systems associated with the aerospace industry.		<ul> <li>Manufacturing standards: MS, AN, MIL, etc.</li> <li>Maintenance and repair standards: <ul> <li>process books</li> <li>Transport Canada standards</li> <li>etc.</li> </ul> </li> <li>Definitions</li> <li>Classification</li> <li>Standards</li> <li>Manufacturer's liability: <ul> <li>civil</li> <li>guarantees</li> <li>performance</li> </ul> </li> <li>ISO standards: <ul> <li>Section 1 – Quality procedure</li> <li>Section 2 – Mobilization</li> </ul> </li> <li>ISO 9001: <ul> <li>design</li> <li>production</li> <li>installation</li> <li>after-sales service</li> </ul> </li> <li>ISO 9002: production and installation activities</li> <li>ISO 9003: <ul> <li>inspection</li> <li>final testing</li> </ul> </li> <li>Rules for the certification of aircraft maintenance personnel by Transport Canada</li> </ul>

Learning Context (first- and second-level operational objectives)	Participation Criteria	Suggested Related Content
F       Learning about the new types of work organization and their impact on the work situation and the environment in the industry.		<ul> <li>New corporate cultures: value-added production, continuous improvement, etc.</li> <li>Means of action:         <ul> <li>improved response time: concurrent engineering, reduction of setup time, flow optimization, on-demand production, networking with clients and suppliers</li> <li>elimination of waste: maintenance management, quality management, redesign of workplace layout</li> <li>economies of scale: design process, flexible equipment</li> <li>job enrichment</li> </ul> </li> <li>Management approaches such as kaisen, kanban, production cells, concurrent engineering, just-in-time</li> <li>Productivity tools such as foolproof devices, statistical quality control, value analysis</li> <li>Impact on the work situation and environment in the aerospace industry:             <ul> <li>increased responsibility of personnel</li> <li>flattening of hierarchical structures</li> <li>multidisciplinarity and teamwork</li> <li>relations with clients and suppliers</li> <li>continuing training</li> <li>job security</li> <li>precise observance of methods and standards</li> <li>rigorous self-inspection and inspection of</li> </ul> </li> </ul>

Learning Context (first- and second-level operational objectives)	Participation Criteria	Suggested Related Content
		<ul> <li>products in order to achieve total quality</li> <li>use of certified materials and tools</li> <li>etc.</li> <li>Role and importance of subcontracting in the aerospace industry</li> </ul>
<ul> <li>PHASE 2 Participation in a Process of Reflection</li> <li>G Considering the importance of being familiar with the evolution of the aerospace industry and the means used by companies to attain their objectives with respect to quality, productivity and competitiveness in the context of a world economy.</li> </ul>	Participate in the suggested activities.	<ul> <li>Importance of being well-informed</li> <li>More accurate overview of the industry, its role and its contribution to the world economy</li> <li>Understanding of the work environment and the particular features of the aerospace industry</li> <li>Motivation to undergo training consistent with current realities</li> <li>Reinforcement of their ability to adapt to new occupational requirements</li> <li>Etc.</li> </ul>

Learning Context (first- and second-level operational objectives)	Participation Criteria	Suggested Related Content
<ul> <li>H Participating in discussions in which they:</li> <li>establish a parallel between the main stages in the evolution of the aerospace industry and the development of new technologies</li> </ul>	• Show an interest and express their opinion.	<ul> <li>See Phase 1</li> <li>Pooling of elements mentioned by each student</li> </ul>
- identify current trends on which to base predictions about the future of the industry		<ul> <li>Globalization of the economy</li> <li>Improvement of performance of equipment: <ul> <li>more lightweight</li> <li>efficiency of propulsion systems</li> <li>improvement or substitution of fuels</li> <li>constant evolution of design</li> </ul> </li> <li>Environmental constraints: <ul> <li>noise level inside and outside the aircraft</li> <li>fuel consumption and impact on air quality</li> <li>use of chemicals in the manufacturing process</li> <li>waste water treatment</li> <li>etc.</li> </ul> </li> <li>Standards in terms of comfort and passengers' needs, etc.</li> </ul>

Learning Context (first- and second-level operational objectives)	Participation Criteria	Suggested Related Content
- identify the factors favouring the growth of the aerospace industry		<ul> <li>Qualification of employees</li> <li>Choice of niches favouring excellence and competitiveness</li> <li>Increased visibility</li> <li>Research and development</li> <li>Strategic alliances</li> <li>Market exploration</li> <li>Fulfillment of clients' needs</li> <li>Etc.</li> </ul>
- determine that conforming to standards is the only way to attain quality objectives in the industry		<ul> <li>Adaptation to supervision</li> <li>Safety, economy and efficiency</li> <li>Impact of errors</li> <li>Sense of responsibility and accountability</li> <li>Professional conscience</li> <li>Etc.</li> </ul>
- associate companies' adoption of new technologies and new types of work organization with the requirements of quality, productivity and competitiveness		<ul> <li>Areas of competitiveness</li> <li>Equipment using new technology</li> <li>Effective design of workplace</li> <li>Optimal use of employees' potential</li> <li>In-service training</li> <li>Reduced inventories</li> <li>Focus on meeting clients' needs</li> <li>Research and development</li> <li>Total quality</li> <li>Etc.</li> </ul>

(	Learning Context first- and second-level operational objectives)	Participation Criteria	Suggested Related Content
	- demonstrate how the new technologies and management techniques influence workers' tasks, their level of responsibility, their relationships with colleagues and superiors and their need for continuing education		<ul> <li>See Phase 1</li> <li>Pooling of elements mentioned by each student</li> </ul>
I	Participating in a suggested activity, for example, attending a conference given by a representative of the aerospace industry or visiting a company.		<ul> <li>Method of collecting information and taking notes</li> </ul>
J	Taking notes. PHASE 3 Evaluation		
K	Synthesizing the information gathered.	<ul> <li>Write a report that:</li> <li>synthesizes the topics dealt with in the learning context</li> </ul>	<ul> <li>Use of a report format</li> <li>Brief presentation of their thoughts on what they have learned</li> </ul>
L	Identifying the advantages of having this new knowledge about the evolution of the aerospace industry.	<ul> <li>explains the importance of being familiar with the evolution of the aerospace industry</li> </ul>	<ul> <li>Clarity and concision</li> </ul>
М	Presenting their thoughts in a report.		

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MODULE 3: READING DRAWINGS AND	D MANUALS	CODE: 869 044 60 hours
Expected Behaviour	Conditions for Performance Evaluation	Suggested Approach
To demonstrate the required competency, the students must <b>interpret drawings, diagrams</b> <b>and manuals, and produce</b> <b>sketches</b> in accordance with the following conditions, criteria and specifications.	<ul> <li>Given: <ul> <li>instructions</li> <li>drawings</li> <li>diagrams</li> <li>manufacturers' manuals</li> </ul> </li> <li>Using materials</li> <li>Referring to course notes</li> </ul>	
	General Performance Criteria	
	<ul> <li>Observance of conventions</li> <li>Speed</li> <li>Neat, careful work</li> <li>Proper use of English and French terminology</li> </ul>	

	Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
1	Distinguish between the systems of measurement.		<ul><li>Imperial system</li><li>Metric system</li></ul>
2	List the types of drawings used in cable and circuit assembly.		<ul> <li>Sketches</li> <li>Diagrams</li> <li>Detail drawings</li> <li>Assembly drawings</li> </ul>
3	Recognize the different types of lines.		<ul> <li>Visible lines</li> <li>Hidden lines</li> <li>Centre line</li> <li>Dimensioning</li> <li>Dotted lines</li> <li>Dashed lines</li> <li>Cut and arrows</li> <li>Hatching</li> </ul>
A	Locate and interpret complementary information related to drawings and diagrams.	<ul> <li>Accurate interpretation of:</li> <li>information</li> <li>symbols</li> <li>abbreviations</li> </ul>	<ul> <li>Information contained in:</li> <li>parts lists</li> <li>title block</li> <li>annotations</li> <li>additional information</li> <li>Symbols and abbreviations</li> <li>Reference points</li> <li>Schedules</li> <li>English and French terminology</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
4 Recognize the importance of handling drawings with care.		<ul><li>Cleanliness</li><li>Folding</li><li>Storage</li></ul>
5 Distinguish among the orientations of the views of an aircraft.		<ul> <li>Forward and aft</li> <li>Left and right</li> <li>Inboard and outboard</li> <li>Top and bottom</li> </ul>
<ul> <li>B Interpret drawings and diagrams containing:</li> <li>projections</li> <li>sections</li> <li>views</li> <li>dimensions</li> <li>symbols</li> </ul>	<ul> <li>Accurate interpretation of:</li> <li>projections</li> <li>sections</li> <li>views</li> <li>dimensions</li> <li>symbols</li> </ul>	<ul> <li>Orthogonal projections: <ul> <li>American</li> <li>European</li> </ul> </li> <li>Isometric and oblique projections</li> <li>Partial and full views</li> <li>Auxiliary views</li> <li>Functional, dimensional and positioning tolerances</li> <li>Interactions (fit)</li> </ul>

	Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
С	Locate and interpret information contained in aircraft drawings and diagrams.	<ul> <li>Accurate location of information</li> <li>Accurate interpretation of information about: <ul> <li>components and parts</li> <li>fasteners</li> <li>electrical parts</li> <li>tolerances</li> <li>parameters</li> <li>dimensions</li> </ul> </li> <li>Recognition of datum lines</li> </ul>	<ul> <li>Mechanical and electrical components and parts</li> <li>Fasteners</li> <li>Tolerances</li> <li>Parameters</li> <li>Dimensions</li> <li>Symbols and abbreviations</li> <li>Relationship between scale and actual dimensions</li> <li>Datum lines for fuselage, wings, etc.</li> <li>English and French terminology</li> </ul>
6	Reproduce lines.		<ul><li>Straight lines</li><li>Angles</li><li>Circles and arcs</li></ul>
D	Sketch parts and assemblies.	<ul> <li>Proper choice of views</li> <li>Proper use of freehand drawing technique</li> <li>Observance of: <ul> <li>layout of views</li> <li>proportions</li> </ul> </li> <li>Neat, clear sketch</li> </ul>	<ul> <li>Freehand drawing technique</li> <li>Orthogonal projection</li> <li>Sectional view</li> <li>Simple auxiliary view</li> <li>Perspective</li> </ul>
Е	Dimension sketches.	<ul> <li>Proper choice of dimensions and symbols</li> <li>Observance of layout of dimensions</li> <li>Accurate dimensioning</li> <li>Relevant notes</li> </ul>	<ul> <li>Functional tolerances</li> <li>Dimensional tolerances</li> <li>Geometric dimensioning</li> <li>Geometric tolerancing</li> <li>Notes</li> </ul>

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Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
F Locate and interpret information contained in the manufacturers' manuals.	<ul> <li>Accurate location of information</li> <li>Accurate interpretation of information about: <ul> <li>components and parts</li> <li>specifications</li> <li>tolerances</li> <li>recommendations</li> </ul> </li> </ul>	<ul> <li>Technical manuals related to: <ul> <li>use</li> <li>inspection</li> <li>maintenance</li> <li>installation</li> <li>etc.</li> </ul> </li> <li>English and French terminology</li> </ul>

MODULE 4: OCCUPATIONAL HEALTH AND SAFETY AND MATERIALS HANDLING		CODE: 869 083 45 hours
Expected Behaviour	Conditions for Performance Evaluation	Suggested Approach
To demonstrate the required competency, the students must <b>apply occupational health and</b> <b>safety rules and materials</b> <b>handling techniques</b> in accordance with the following conditions, criteria and specifications.	<ul> <li>Given: <ul> <li>learning contexts or case studies</li> <li>an emergency response plan</li> <li>manufacturers' manuals</li> </ul> </li> <li>Using: <ul> <li>aircraft electrical system components</li> <li>handling accessories and equipment</li> <li>tools</li> <li>equipment</li> <li>materials</li> <li>charts and tables</li> <li>the relevant documentation</li> </ul> </li> <li>Referring to course notes</li> <li>General Performance Criteria</li> </ul> <li>Relevant association of risks of industrial accidents and occupational diseases with preventive measures</li> <li>Appropriate use of documentation</li> <li>Appropriate use of equipment</li>	

	Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
1	Be familiar with the main organizations associated with occupational health and safety.		<ul> <li>Commission de la santé et de la sécurité du travail (CSST)</li> <li>Commission des accidents du travail (CAT)</li> <li>Commission d'appel en matière de lésions professionnelles</li> <li>Sector-based and parity associations</li> </ul>
2	Understand the importance of raising employers' awareness of occupational health and safety.		<ul> <li>Consequences and cost of industrial accidents and occupational diseases</li> <li>Effect on production and working climate</li> </ul>
3	Be familiar with possible recourse in matters of occupational health and safety.		<ul> <li>Civil recourse:</li> <li>illegal dismissal</li> <li>precautionary cessation of work</li> <li>etc.</li> <li>Legal recourse</li> </ul>
A	Associate laws and regulations respecting occupational health and safety with the situation of an aircraft cable and circuit assembly plant.	<ul> <li>Relevant association of laws and regulations with the tasks performed</li> <li>Appropriate explanation of the rights and obligations of employers and employees as stipulated in the legislation</li> </ul>	<ul> <li>Laws and regulations: <ul> <li>Act respecting occupational health and safety</li> <li>Act respecting industrial accidents and occupational diseases</li> <li>Act respecting labour standards</li> <li>etc.</li> </ul> </li> <li>List of rights and responsibilities of workers and employers</li> </ul>

	Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
4	Learn about the dangers related to automatisms.		<ul> <li>Distraction</li> <li>Tendinitis</li> <li>Bursitis</li> <li>Etc.</li> </ul>
5	Recognize various dangerous situations in the workplace.		• Observable, hidden, biological, chemical, psychological stressors
В	Associate the main health and safety risks with the tasks performed in an aircraft cable and circuit assembly plant.	<ul> <li>Appropriate association in terms of:</li> <li>equipment</li> <li>materials</li> <li>products</li> <li>processes</li> <li>methods</li> <li>work environment</li> <li>organization of work</li> </ul>	• List of dangers and risks associated with tasks
6	State the advantages of prevention and describe methods of promoting it.		<ul> <li>Time and money saved</li> <li>Preservation of physical and psychological well-being of workers</li> <li>Means of promoting prevention: <ul> <li>posters</li> <li>awareness campaigns</li> <li>etc.</li> </ul> </li> </ul>

	Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
7	Distinguish among the items on a Workplace Hazardous Materials Information System (WHMIS) data sheet for products used in aircraft cable and circuit assembly.		<ul> <li>Symbols, codes and colours</li> <li>Warnings</li> <li>Care</li> <li>Hazardous and toxic products: <ul> <li>solvents</li> <li>detergents</li> <li>lubricants</li> <li>paints</li> <li>glues</li> <li>chemicals</li> <li>etc.</li> </ul> </li> </ul>
8	List various methods for the environmentally safe disposal of pollutants.		<ul><li>Recycling</li><li>Storage methods</li><li>Methods of disposal</li></ul>
С	Explain the preventive measures to be taken in an aircraft cable and circuit assembly plant.	<ul> <li>Appropriate choice of means of disseminating information</li> <li>Clear, concise messages</li> <li>Accurate information transmitted</li> </ul>	<ul> <li>Adoption of safe behaviours</li> <li>Individual and collective protective equipment</li> <li>Ergonomics</li> <li>Methods of communication and signalling in dangerous work situations</li> <li>Safe installation of equipment</li> <li>Measures specific to electrical installations</li> <li>Safe handling and disposal of hazardous and toxic products (WHMIS)</li> <li>Means of preventing occupational diseases (respiratory illnesses, dermatosis, etc.)</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
D Explain the main measures to be taken in case of emergency.	<ul> <li>Appropriate choice of means of disseminating information</li> <li>Clear, concise messages</li> <li>Accurate instructions</li> </ul>	<ul> <li>Measures to be taken depending on: <ul> <li>the category of fire</li> <li>the nature of the incident or accident</li> <li>the available resources</li> </ul> </li> <li>Appropriateness of providing first aid or requesting help</li> </ul>
9 Define "hoisting" and "handling."		<ul> <li>Hoisting: act of lifting a load</li> <li>Handling: moving of loads by mechanical means for storage, shipping, installation or repair purposes</li> </ul>
10 Define "centre of gravity."		• Centre of gravity: point at which the total weight of the object acts as a concentrated force, whatever its position
E Determine the centre of gravity and estimate loads.	<ul> <li>Accurate location of centre of gravity</li> <li>Accurate calculations</li> <li>Appropriate estimate of loads</li> </ul>	<ul> <li>Determination of centre of gravity by observation: <ul> <li>regularly shaped object: always at centre</li> <li>irregularly shaped object: approximate identification of location ⊗ by trial and error until the load is well balanced</li> </ul> </li> <li>Conditions ensuring a balanced load</li> <li>Means of estimating loads using: <ul> <li>waybills</li> <li>drawings</li> <li>catalogues</li> <li>approximate calculation of weight of load (volume, mass, weight)</li> </ul> </li> </ul>

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Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
11 Define the safety factor.		<ul> <li>Definition of:</li> <li>rated load</li> <li>maximum load</li> <li>formulas</li> </ul>
12 Recognize signalling methods.		<ul> <li>Appropriate signalling during manoeuvre</li> <li>Manual signalling</li> <li>Verbal signalling: <ul> <li>voice</li> <li>transmission devices (radio transmitter, telephone)</li> </ul> </li> <li>Meaning of signals and terminology</li> </ul>
F Sling, lift and move materials and equipment safely.	<ul> <li>Proper use of technique</li> <li>Materials and equipment solidly fastened</li> <li>Consideration of the capacity of the accessories</li> <li>Appropriate protection of accessories or slings</li> <li>Observance of manufacturer's recommendations</li> <li>Balanced and stable load in accordance with volume, shape and weight</li> <li>Observance of health and safety rules</li> </ul>	<ul> <li>Inspection of accessories and devices</li> <li>Position of slings</li> <li>Anchor points of load</li> <li>Hoisting angle</li> <li>Sizes of slings</li> <li>Safety factor</li> <li>Capacity according to tables</li> <li>Protection of slings against: <ul> <li>wear</li> <li>abrasion</li> <li>sudden tension</li> <li>crushing</li> <li>kinking</li> <li>overloading</li> </ul> </li> <li>Use of shims and protectors</li> <li>Method of operating: <ul> <li>overhead travelling cranes</li> <li>hand-operated jib cranes</li> </ul> </li> </ul>

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Behaviour and Second-Level Objectives	
	<ul> <li>Hoisting methods: <ul> <li>cable</li> <li>chain</li> <li>with or without slings</li> </ul> </li> <li>Lifting tests</li> <li>Inspection of anchors and anchor points</li> <li>Protection of load</li> <li>Movement: <ul> <li>vertical</li> <li>horizontal</li> </ul> </li> <li>Prohibited area: <ul> <li>distance</li> <li>manoeuvring surface and height</li> </ul> </li> <li>Individual and collective protection</li> </ul>

<b>Expected Behaviour</b>	<b>Conditions for Performance Evaluation</b>	Suggested Approach
To demonstrate the required competency, the students must <b>apply concepts and techniques</b> related to electricity n accordance with the following conditions, criteria and pecifications.	<ul> <li>Given: <ul> <li>instructions</li> <li>drawings and diagrams</li> </ul> </li> <li>Using: <ul> <li>electrical components</li> <li>tools and measuring instruments</li> <li>actual aeronautics equipment or simulation benches</li> <li>materials</li> </ul> </li> <li>Referring to course notes</li> </ul>	
	<ul> <li>General Performance Criteria</li> <li>Observance of health and safety rules</li> <li>Observance of process</li> <li>Observance of manufacturer's recommendations</li> <li>Proper use of tools, equipment, instruments and materials</li> <li>Accurate measurements</li> <li>Accurate calculations</li> <li>Speed</li> <li>Neat, careful work</li> <li>Proper use of English and French terminology</li> <li>Assembly in conformity with drawings and diagrams</li> </ul>	

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	Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
1	Describe the atomic structure of the elements.		<ul> <li>Elements in the periodic table:</li> <li>conductors</li> <li>insulators</li> <li>Representation of atomic structure: composition of elements</li> </ul>
2	Be familiar with the terms and symbols used in electricity.		<ul> <li>Meaning of terms and symbols related to:</li> <li>voltage</li> <li>amperage</li> <li>magnetism</li> <li>inductance</li> <li>wattage</li> <li>diodes</li> <li>transformers</li> <li>motors</li> <li>etc.</li> </ul>
3	Recognize the principles underlying the production and transmission of electrical energy.		<ul> <li>Definition of electricity</li> <li>Energy source: <ul> <li>mechanical</li> <li>chemical</li> <li>magnetic</li> <li>thermal</li> <li>etc.</li> </ul> </li> <li>Conventional and actual direction of current</li> </ul>

	Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
4	Differentiate among the components of electrical circuits.		<ul> <li>Components such as:</li> <li>power source</li> <li>resistors</li> <li>relays</li> <li>reactors</li> <li>lights</li> <li>solenoids</li> <li>diodes</li> <li>Characteristics</li> <li>Functions</li> </ul>
5	Explain Ohm's law.		<ul><li>Explanation of principles</li><li>Formula and calculations</li></ul>
6	Distinguish among series, parallel and series parallel circuits.		<ul> <li>Presentation of circuit diagrams</li> <li>Characteristics of the different types of circuits: <ul> <li>voltage dividers</li> <li>current dividers</li> </ul> </li> <li>Operating principles</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
A Solve mathematical problems applied to electrical circuits.	<ul> <li>Appropriate choice of formulas</li> <li>Appropriate use of formulas</li> <li>Use of appropriate units</li> </ul>	<ul> <li>Use of formulas and calculations related to: <ul> <li>voltage</li> <li>amperage</li> <li>resistance</li> <li>wattage</li> <li>etc.</li> </ul> </li> <li>Calculations related to series, parallel and series parallel circuits</li> <li>Units of measurement</li> </ul>
7 Describe the basic principles of magnetism and electromagnetism.		<ul> <li>Characteristics of magnets</li> <li>Definition of magnetism</li> <li>Explanation of properties: <ul> <li>line of force</li> <li>flow</li> <li>natural magnetism</li> </ul> </li> <li>Magnetic field</li> <li>Magnetic permeability</li> <li>Mathematical symbols and formulas</li> <li>Application: <ul> <li>magnets</li> <li>reactors</li> <li>transformers</li> <li>alternators</li> <li>etc.</li> </ul> </li> <li>Transformation of alternating current into direct current</li> </ul>

	Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
8	Be familiar with the protection and monitoring devices in electrical circuits.		• Fuse, breaker, switch, rheostat, potentiometer, pushbutton, etc.
В	Locate information needed for the job in electrical drawings and diagrams.	<ul> <li>Identification of all the necessary information</li> <li>Accurate interpretation of: <ul> <li>symbols</li> <li>values</li> </ul> </li> <li>Recognition of components and their interactions</li> </ul>	<ul> <li>Symbols</li> <li>Values: <ul> <li>wattage</li> <li>amperage</li> <li>voltage</li> <li>resistance</li> <li>etc.</li> </ul> </li> <li>Circuit components</li> <li>Operation of circuits</li> <li>English and French terminology</li> </ul>
С	Draw a circuit diagram.	<ul> <li>Appropriate selection of symbols</li> <li>Appropriate arrangement of components</li> <li>Clear, accurate diagram</li> </ul>	<ul> <li>Technique for drawing diagrams</li> <li>Symbols</li> <li>Components</li> <li>Arrangement of components</li> <li>Etc.</li> </ul>
9	Recognize the different measuring instruments used in electricity.		<ul> <li>Measuring instruments:</li> <li>voltmeter</li> <li>ammeter</li> <li>ohmmeter</li> <li>multimeter</li> <li>milliohmmeter</li> <li>megohmmeter</li> <li>etc.</li> </ul>

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Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
10 Distinguish the causes of errors in measurement.		<ul> <li>Scales, ranges, parallax</li> <li>Sensitivity</li> <li>Etc.</li> </ul>
<ul> <li>D Assemble an electrical circuit:</li> <li>- direct current</li> <li>- alternating current</li> </ul>	<ul> <li>Appropriate selection of components</li> <li>Precise, solid assembly</li> </ul>	<ul> <li>Use of simulation table</li> <li>Arrangement of circuit components: <ul> <li>resistors</li> <li>relays</li> <li>diodes</li> <li>switches</li> <li>etc.</li> </ul> </li> <li>Location of power source</li> <li>Assembly techniques</li> <li>Methods of connecting components</li> <li>Methods of using tools</li> <li>Individual and collective protection</li> </ul>
E Check the operation of the electrical circuit.	<ul> <li>Accurate reading of measurements</li> <li>Accurate interpretation of readings</li> <li>Recognition of problems</li> <li>Normal functioning of circuit</li> </ul>	<ul> <li>Testing of electrical circuit on the bench: <ul> <li>start-up of circuit</li> <li>selection of voltage</li> <li>measurement</li> <li>setting of parameters (amperage, voltage, etc.)</li> </ul> </li> <li>Methods of using the measurement instruments listed in objective 9</li> <li>Recording of values measured</li> <li>Detection of operating problems</li> <li>Replacement of components as needed</li> <li>Individual and collective protection</li> </ul>

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Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
F Tidy up. - t - c - i - r • Clea	ropriate storage and cleaning of: ools equipment nstruments naterials n workstation	<ul> <li>Methodical storage</li> <li>Use of cleaning products and materials</li> </ul>
MODULE 6: READING DRAWINGS AN	ND MANUALS	CODE: 798 013 45 hours
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Expected Behaviour	<b>Conditions for Performance Evaluation</b>	Suggested Approach
To demonstrate the required competency, the students must <b>interpret drawings, diagrams</b> <b>and manuals</b> in accordance with the following conditions, criteria and specifications.	<ul> <li>Given:         <ul> <li>instructions</li> <li>drawings</li> <li>diagrams</li> <li>manufacturers' manuals</li> </ul> </li> <li>Referring to course notes</li> </ul>	
	Observence of conventions	
	<ul> <li>Observance of conventions</li> <li>Proper use of English and French terminology</li> </ul>	

	Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
1	Distinguish between the systems of measurement.		<ul><li>Imperial system</li><li>Metric system</li></ul>
2	List the types of drawings used in cable and circuit assembly.		<ul> <li>Sketches</li> <li>Diagrams</li> <li>Detail drawings</li> <li>Assembly drawings</li> </ul>
3	Recognize the different types of lines.		<ul> <li>Visible lines</li> <li>Hidden lines</li> <li>Centre line</li> <li>Dimensioning</li> <li>Dotted lines</li> <li>Dashed lines</li> <li>Cut and arrows</li> <li>Hatching</li> </ul>
Α	Locate and interpret complementary information related to drawings and diagrams.	<ul> <li>Accurate interpretation of:</li> <li>information</li> <li>symbols</li> <li>abbreviations</li> </ul>	<ul> <li>Information contained in:</li> <li>parts lists</li> <li>title block</li> <li>annotations</li> <li>additional information</li> <li>Symbols and abbreviations</li> <li>Reference points</li> <li>Schedules, etc.</li> <li>English and French terminology</li> </ul>

	Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
4	Recognize the importance of handling drawings with care.		<ul><li>Cleanliness</li><li>Folding</li><li>Storage</li></ul>
В	Interpret drawings and diagrams containing: projections sections views dimensions symbols	<ul> <li>Accurate interpretation of:</li> <li>projections</li> <li>sections</li> <li>views</li> <li>dimensions</li> <li>symbols</li> </ul>	<ul> <li>Orthogonal projections: <ul> <li>American</li> <li>European</li> </ul> </li> <li>Isometric and oblique projections</li> <li>Partial and full sections</li> <li>Auxiliary views</li> <li>Functional, dimensional and positioning tolerances</li> <li>Interactions</li> </ul>
С	Locate and interpret information needed for the job in drawings and diagrams.	<ul> <li>Accurate location of information</li> <li>Accurate interpretation of information about: <ul> <li>components and parts</li> <li>fasteners</li> <li>electrical components</li> <li>tolerances</li> <li>parameters</li> <li>dimensions</li> </ul> </li> <li>Recognition of datum lines</li> </ul>	<ul> <li>Mechanical and electrical components and parts</li> <li>Fasteners</li> <li>Tolerances</li> <li>Parameters</li> <li>Dimensions</li> <li>Symbols and abbreviations</li> <li>Relationship between scale and actual dimensions</li> <li>Datum lines for various cabinets or consoles (telecommunications, etc.)</li> <li>English and French terminology</li> </ul>

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Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
D Locate and interpret information contained in manufacturers' manuals.	<ul> <li>Accurate location of information</li> <li>Accurate interpretation of information about: <ul> <li>components and parts</li> <li>specifications</li> <li>tolerances</li> <li>recommendations</li> </ul> </li> </ul>	<ul> <li>Technical manuals related to: <ul> <li>use</li> <li>inspection</li> <li>maintenance</li> <li>installation</li> <li>etc.</li> </ul> </li> <li>English and French terminology</li> </ul>

MODULE 7: OCCUPATIONAL HEALTH	I AND SAFETY	CODE: 798 022 30 hours
Expected Behaviour	Conditions for Performance Evaluation	Suggested Approach
To demonstrate the required competency, the students must <b>prevent occupational health and</b> <b>safety risks</b> in accordance with the following conditions, criteria and specifications.	<ul> <li>Given: <ul> <li>learning contexts or case studies</li> <li>an emergency response plan</li> </ul> </li> <li>Using the relevant documentation</li> <li>Referring to course notes</li> </ul>	
	General Performance Criteria	
	<ul> <li>Relevant association of risks of industrial accidents and occupational diseases with preventive measures</li> <li>Appropriate use of documentation</li> </ul>	

	Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
1	Be familiar with the main organizations associated with occupational health and safety.		<ul> <li>Commission de la santé et de la sécurité du travail (CSST)</li> <li>Commission des accidents du travail (CAT)</li> <li>Commission d'appel en matière de lésions professionnelles</li> <li>Sector-based and parity associations</li> </ul>
2	Understand the importance of raising employers' awareness of occupational health and safety.		<ul> <li>Consequences and cost of industrial accidents and occupational diseases</li> <li>Effect on production and working climate</li> </ul>
3	Be familiar with possible recourse in matters of occupational health and safety.		<ul> <li>Civil recourse:</li> <li>illegal dismissal</li> <li>precautionary cessation of work</li> <li>etc.</li> <li>Legal recourse</li> </ul>
A	Associate laws and regulations respecting occupational health and safety with the situation of a photonics cable and circuit assembly plant.	<ul> <li>Relevant association of laws and regulations with the tasks performed</li> <li>Appropriate explanation of the rights and obligations of employers and employees as stipulated in the legislation</li> </ul>	<ul> <li>Laws and regulations: <ul> <li>Act respecting occupational health and safety</li> <li>Act respecting industrial accidents and occupational diseases</li> <li>Act respecting labour standards</li> <li>etc.</li> </ul> </li> <li>List of rights and responsibilities of workers and employers</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
4 Learn about the dangers related to automatisms.		<ul> <li>Distraction</li> <li>Tendinitis</li> <li>Bursitis</li> <li>Etc.</li> </ul>
5 Recognize various dangerous situations in the workplace.		• Observable, hidden, biological, chemical, psychological stressors
B Associate the main health and safety risks with the tasks performed in an optics- photonics cable and circuit assembly plant.	<ul> <li>Appropriate association in terms of:</li> <li>equipment</li> <li>materials</li> <li>products</li> <li>processes</li> <li>methods</li> <li>work environment</li> <li>organization of work</li> </ul>	• List of dangers and risks associated with tasks
6 State the advantages of prevention and describe methods of promoting it.		<ul> <li>Time and money saved</li> <li>Preservation of physical and psychological well-being of workers</li> <li>Means of promoting prevention: <ul> <li>posters</li> <li>awareness campaigns</li> <li>etc.</li> </ul> </li> </ul>

	Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
7	Distinguish among the items on a WHMIS data sheet for products used in photonics cable and circuit assembly.		<ul> <li>Symbols, codes and colours</li> <li>Warnings</li> <li>Care</li> <li>Hazardous and toxic products: <ul> <li>solvents</li> <li>detergents</li> <li>lubricants</li> <li>paints</li> <li>glues</li> <li>chemicals</li> <li>etc.</li> </ul> </li> </ul>
8	List various methods for the environmentally safe disposal of pollutants.		<ul><li>Recycling</li><li>Storage methods</li><li>Methods of disposal</li></ul>
С	Explain the preventive measures to be taken in an optics- photonics cable and circuit assembly plant.	<ul> <li>Appropriate choice of means of disseminating information</li> <li>Clear, concise messages</li> <li>Accurate information transmitted</li> </ul>	<ul> <li>Adoption of safe behaviours</li> <li>Individual and collective protective equipment</li> <li>Ergonomics</li> <li>Methods of communication and signalling in dangerous work situations</li> <li>Safe installation of equipment</li> <li>Measures specific to electrical installations</li> <li>Safe handling and disposal of hazardous and toxic products (WHMIS)</li> <li>Means of preventing occupational diseases (respiratory illnesses, dermatosis, etc.)</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
D Explain the main measures to be taken in case of emergency.	<ul> <li>Appropriate choice of means of disseminating information</li> <li>Clear, concise messages</li> <li>Accurate instructions</li> </ul>	<ul> <li>Measures to be taken depending on: <ul> <li>the category of fire</li> <li>the nature of the incident or accident</li> <li>the available resources</li> </ul> </li> <li>Appropriateness of providing first aid or requesting help</li> </ul>

MODULE 8: ANALYSIS OF THE OPERATION OF AN OPTICS-PHOTONICS CIRCUIT		CODE: 798 038 120 hours
<b>Expected Behaviour</b>	<b>Conditions for Performance Evaluation</b>	Suggested Approach
To demonstrate the required competency, the students must <b>analyze the operation of an</b> <b>optics-photonics circuit and its</b> <b>components</b> in accordance with the following conditions, criteria and specifications.	<ul> <li>Given:         <ul> <li>integrated optics components</li> <li>manufacturers' specifications</li> <li>a glossary of English and French photonics terms</li> </ul> </li> <li>Using:         <ul> <li>measuring instruments and devices</li> <li>tables or graphs</li> <li>the relevant documentation</li> </ul> </li> </ul>	
	General Performance Criteria	
	• Observance of health and safety rules	
	Observance of standards     Appropriate intermetation of information	
	• Appropriate interpretation of information contained in documentation	
	Proper use of English and French terminology	

	Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
1	Be familiar with the highlights of the evolution of optics-photonics.		<ul> <li>History of photonics</li> <li>Developments in photonics</li> <li>Electro-optics and all fibre</li> <li>Current and future products</li> </ul>
2	Be familiar with the terms and symbols used in optics-photonics.		<ul> <li>Meaning of terms and symbols related to:</li> <li>light</li> <li>wattage</li> <li>waves</li> <li>polarization</li> <li>equipment, tools and materials</li> <li>optical systems</li> <li>etc.</li> </ul>
3	Describe the work environment in optics-photonics.		• Bench work, work in clean room, in the laboratory, in a cell, etc.
Α	Recognize the different concepts related to light.	<ul> <li>Appropriate association of light phenomena and their applications</li> <li>Appropriate links between the travel of light in fibre optics and information transfer</li> </ul>	<ul> <li>Theories of light</li> <li>Characteristics of light waves</li> <li>Refraction and reflection of light</li> <li>Snell's law</li> <li>Cut-off frequencies</li> <li>Bandwidths</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
4 Differentiate among the components of an optics- photonics system.		<ul> <li>Optical sources</li> <li>Detectors</li> <li>Receivers</li> <li>Polarizers</li> <li>Filters</li> <li>Couplers</li> <li>Bragg gratings</li> <li>Gain amplifiers</li> <li>Gain filters</li> <li>Equalizers</li> <li>Etc.</li> </ul>
5 Recognize different measuring instruments and devices used in optics-photonics and electricity.		<ul> <li>Instruments and devices related to optics-photonics: <ul> <li>powermeter</li> <li>interferometer</li> <li>videoscope</li> <li>optical return loss (ORL)</li> <li>optical spectrum analyzer (OSA)</li> <li>reflectometer (OTDR)</li> <li>etc.</li> </ul> </li> <li>Instruments and devices related to electricity: <ul> <li>milliohmmeter</li> <li>multimeter</li> </ul> </li> <li>Characteristics</li> <li>Functions</li> </ul>

	Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
B	Take readings on components of: - an optics-photonics circuit - an electrical circuit	<ul> <li>Appropriate choice of instrument or device for the type of measurement to be taken</li> <li>Proper use of measuring instruments and devices</li> <li>Accurate interpretation of readings</li> <li>Appropriate association of units of measurement with their applications</li> <li>Detection of anomalies</li> </ul>	<ul> <li>Methods of using measuring instruments and devices</li> <li>Recording of values</li> <li>Most frequent operating problems</li> <li>Individual and collective protection</li> </ul>
С	Do mathematical calculations applied to optics-photonics.	<ul> <li>Appropriate choice of formulas for type of calculation to be done</li> <li>Appropriate use of formulas</li> <li>Use of appropriate units of measurement</li> <li>Accurate calculations</li> </ul>	<ul> <li>Use of formulas and performance of calculations related to: <ul> <li>frequency</li> <li>wavelength</li> <li>speed</li> <li>reflection</li> <li>refraction</li> <li>numerical aperture</li> <li>total internal reflection</li> <li>conversions (dBM, dB, watt, percentages)</li> </ul> </li> </ul>
D	Evaluate the power of an optical signal.	<ul> <li>Appropriate measurement of power in decibels</li> <li>Accurate calculation of percentages of power gain and loss</li> <li>Recording of relevant data on a product evaluation form</li> <li>Accurate interpretation of exponential curve</li> </ul>	<ul> <li>Definition of optical power</li> <li>Decibels</li> <li>Power loss and gain</li> <li>Percentages</li> </ul>

<b>Expected Behaviour</b>	Conditions for Performance Evaluation	Suggested Approach
Expected Behaviour To demonstrate the required competency, the students must adapt to new types of work organization in accordance with the following conditions, criteria and specifications.	<ul> <li>Conditions for Performance Evaluation</li> <li>Working in a team</li> <li>Given all the information related to the operation of a manufacturing company</li> <li>Using the relevant documentation</li> <li>In an atmosphere of respect and openness</li> </ul>	<ul> <li>Suggested Approach</li> <li>Tools have been developed to provide instructors with the necessary support in terr of approach and content.</li> <li>Instructors should be obliged to undergo in- service training.</li> </ul>

	Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
A	Recognize the production management approaches of the company and their effects on the type of work organization.	<ul> <li>Recognition of the company's management philosophies, such as Taylorism and value-added output</li> <li>Proper description of the type of structural organization:         <ul> <li>hierarchical organization</li> <li>semiautonomous teams</li> <li>autonomous teams</li> </ul> </li> <li>Recognition of the effects on production and on the evolution of tasks in the company</li> </ul>	• ISO 9000 and ISO 14000 quality management standards
В	Recognize the means used to promote the continual improvement of productivity.	<ul> <li>Accurate differentiation among the instruments or techniques used in the company</li> <li>Relevant associations between the means used and the company's ability to meet the requirements of the new economy, such as: <ul> <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>Recognition of the contribution of personnel to the improvement of productivity</li> </ul>	Production management methods

	Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
C	Communicate verbally with others.	<ul> <li>Choice of types of questions required to obtain relevant information</li> <li>Proper reformulation of areas of agreement and disagreement in a discussion</li> <li>Proper reformulation and reflection of a verbal message</li> <li>Constructive and accurate feedback to: <ul> <li>encourage improvement in behaviour</li> <li>recognize and encourage the contribution of colleagues</li> </ul> </li> <li>Relevant and persuasive expression of their point of view</li> <li>Openness to controversial comments</li> <li>Use of an effective approach to deal with emotional behaviour</li> </ul>	<ul> <li>Communication process</li> <li>Obstacles to communication</li> <li>Role of perception and defence mechanisms</li> <li>Productive attitudes</li> <li>Types of questions</li> <li>Reformulation</li> <li>Reflection</li> <li>Summary of discussions</li> <li>Specific feedback based on personal experience</li> <li>Reaction to emotional behaviour</li> <li>Arguments supporting an opinion</li> </ul>
D	Solve problems related to the organization of work.	<ul> <li>Appropriate choice of problem-solving tools and techniques depending on the complexity of the problem to be solved</li> <li>Clear description of the problem</li> <li>Determination of the causes and consequences of the problem</li> <li>Choice of best solution in accordance with established criteria</li> <li>Realistic plan of action</li> <li>Clearly defined and scheduled follow-up mechanisms</li> </ul>	<ul> <li>Advantages of using a problem-solving process</li> <li>Simple process</li> <li>Tools and techniques</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
E Work in a multidisciplinary team.	<ul> <li>Determination of the goals of the team and the results to be achieved in accordance with the company's mission and values</li> <li>Consensus on team rules</li> <li>Determination of the responsibilities of each team member</li> <li>Appropriate planning of work</li> <li>Consensus decision making</li> <li>Recognition of styles of participation</li> <li>Description of factors favourable and unfavourable to the success of each of the stages in the development of a work team</li> </ul>	<ul> <li>Bases of an effective work team</li> <li>Cooperation as opposed to competition</li> <li>Roles within the team</li> <li>Team rules</li> <li>Styles of participation</li> <li>Planning stages</li> <li>Consensus decision-making process</li> <li>Stages in the growth of a work team</li> </ul>

MODULE 10: WORK PROCEDURES AND CC	OMPUTERS	CODE: 869 064 60 hours
Expected Behaviour	Conditions for Performance Evaluation	Suggested Approach
To demonstrate the required competency, the students must <b>apply various work procedures</b> <b>and use computer hardware</b> in accordance with the following conditions, criteria and specifications.	Given: - work procedures - drawings or diagrams - a glossary of English and French terms Using: - a microcomputer and peripherals - software Referring to course notes <b>General Performance Criteria</b> Accurate interpretation of information contained in the documents Appropriate use of documentation Proper use of English and French terminology Proper use of equipment and materials	

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
1 Understand the role and nature of work procedures.		<ul> <li>Modern industrialization</li> <li>Needs of the company</li> <li>Content of procedures</li> <li>Importance of procedures</li> <li>Standardization of documentation</li> <li>Concepts: <ul> <li>time, money, quality</li> <li>work tools</li> </ul> </li> </ul>
2 Distinguish among the departments that support production in a company.		<ul> <li>Organizational structure of a company</li> <li>Departments: <ul> <li>management</li> <li>marketing</li> <li>engineering</li> <li>practices and procedures</li> <li>production control</li> <li>production</li> <li>quality assurance</li> <li>finance and administration</li> <li>procurement</li> <li>human resources</li> </ul> </li> <li>Description of their roles</li> <li>Links between the services</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
3 Define the goals of communication.		<ul> <li>Means of communication: <ul> <li>verbal (meetings)</li> <li>written (procedures)</li> </ul> </li> <li>Accurate, clear message</li> <li>Goals of communication</li> <li>Importance of feedback</li> </ul> <li>Importance of discussing the issue of teamwork vs. individual work</li>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
4 Recognize the main documents related to work procedures.		<ul> <li>Documents related to work procedures in <i>aerospace</i> and <i>optics-photonics</i>: <ul> <li>parts list</li> <li>material shortage sheet</li> <li>record sheet</li> <li>traveler</li> <li>operation sequence sheet</li> <li>change request for process or drawing</li> <li>drawings</li> <li>modification sheet</li> <li>snag sheet</li> <li>rejects report</li> <li>tool record</li> <li>part serial number record</li> <li>reworking sheet</li> <li>etc.</li> </ul> </li> <li>Reference documents in <i>aerospace</i>: <ul> <li>company standards</li> <li>inspection sheet</li> <li>etc.</li> </ul> </li> <li>Reference documents in <i>optics-photonics</i>: <ul> <li>company standards</li> <li>technical manuals</li> <li>inspection sheet</li> <li>etc.</li> </ul> </li> </ul>

Specifications of the Expected Specifications of the Expected Specification Specificat	cific Performance Criteria	Suggested Related Content
A Associate work procedures with wire and cable assembly tasks. - role - conte - use • Proper as to be don	<ul> <li>te distinction of procedures to their:</li> <li>at</li> <li>sociation of procedures with the job</li> <li>e</li> </ul>	<ul> <li>Reference documents listed in objective 4</li> <li>Relationship between drawings and documents</li> <li>Aerospace tasks: <ul> <li>manufacturing</li> <li>forming</li> <li>mounting</li> <li>assembly</li> <li>subassembly</li> <li>installation</li> <li>troubleshooting</li> <li>repair</li> <li>maintenance</li> <li>marking</li> <li>inspection and testing</li> <li>etc.</li> </ul> </li> <li>Optics-photonics tasks: <ul> <li>manufacturing</li> <li>assembly</li> <li>integration</li> <li>troubleshooting</li> <li>maintenance</li> <li>manufacturing</li> <li>assembly</li> <li>integration</li> <li>troubleshooting</li> <li>maintenance</li> <li>manufacturing</li> <li>assembly</li> <li>integration</li> <li>troubleshooting</li> <li>maintenance</li> <li>marking</li> <li>inspection and testing</li> <li>etc.</li> </ul> </li> </ul>

	Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
B	Locate and interpret information needed for the job in work procedures.	<ul> <li>Appropriate selection of documents for the job to be done</li> <li>Observance of methods of using documents</li> <li>Accurate interpretation of: <ul> <li>instructions</li> <li>drawings and diagrams</li> <li>information</li> <li>abbreviations</li> </ul> </li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Location of information about: <ul> <li>the tasks to be performed</li> <li>special tools and equipment</li> <li>materials and products</li> <li>the necessary raw materials</li> <li>components</li> <li>techniques and standards</li> <li>the necessary drawings</li> <li>effectiveness (applicability) in terms of the device's serial number (equivalences)</li> </ul> </li> <li>Meaning of abbreviations</li> <li>English and French terminology</li> </ul>
5	Recognize different ways to report technical notes in English.		<ul> <li>Aerospace and optics-photonics</li> <li>Presentation of sample reports: <ul> <li>process change requests</li> <li>drawing change requests</li> </ul> </li> <li>Different ways of describing the problem</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
C Note the relevant information in the work procedures.	<ul> <li>Clear, accurate information</li> <li>Accurate notes</li> <li>Inclusion of all the necessary information</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Documents related to procedures (listed in objective 4)</li> <li>Procedure for filling out forms: observance of steps</li> <li>Personal stamp to be used on: <ul> <li>progress card</li> <li>list of missing parts</li> <li>maintenance record</li> <li>record card</li> </ul> </li> <li>English and French abbreviations</li> <li>English and French terminology</li> </ul>
6 Describe the different types of microcomputers.		<ul><li>Personal</li><li>Commercial</li><li>Industrial</li></ul>
7 Show concern for handling the microcomputer and peripherals with care.		<ul> <li>Transportation</li> <li>Cleaning</li> <li>Installation: <ul> <li>magnetic environment</li> <li>solid assembly</li> <li>etc.</li> </ul> </li> </ul>
8 Describe the specific characteristics of different types of computers.		<ul> <li>Families:</li> <li>IBM</li> <li>Macintosh</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
9 Recognize the peripherals of a microcomputer.		<ul> <li>Monitor</li> <li>Keyboard</li> <li>Hard disk</li> <li>Diskette drive</li> <li>Mouse</li> <li>Printer</li> <li>Fax modem</li> <li>Digitizer</li> <li>Etc.</li> </ul>
10 Identify the input and output connections of a microcomputer.		<ul> <li>Monitor input</li> <li>Printer port</li> <li>Keyboard</li> <li>Mouse</li> <li>Serial port</li> </ul>
D Connect different peripherals to the microcomputer.	<ul> <li>Observance of procedure</li> <li>Observance of manufacturer's recommendations</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Consultation of manufacturer's manual</li> <li>Type of connection: <ul> <li>monitor</li> <li>keyboard</li> <li>printer</li> <li>fax modem</li> <li>digitizer</li> <li>etc.</li> </ul> </li> <li>Printer configuration</li> </ul>

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Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
<ul><li>11 List the main operating systems.</li><li>E Perform operations on a</li></ul>	Observance of techniques for:	<ul> <li>DOS, Windows, etc.</li> <li>Particular characteristics of each system</li> <li>Interface</li> </ul> Aerospace and optics-photonics
microcomputer using: - an operating system - a software program	<ul> <li>using commands</li> <li>locating information</li> <li>inputting data</li> <li>Accurate interpretation of codes</li> <li>Appropriate use of software program</li> </ul>	<ul> <li>Operation of: <ul> <li>screen</li> <li>keyboard</li> <li>hard disk</li> <li>printer</li> <li>etc.</li> </ul> </li> <li>Loading applications</li> <li>Creating directories and files</li> <li>Searching for a file</li> <li>Displaying</li> <li>Links between commands and codes</li> <li>Inputting data</li> <li>Using software associated with the different assembly tasks</li> <li>Basic operations: <ul> <li>formatting</li> <li>copying</li> <li>deleting</li> <li>saving</li> <li>printing</li> <li>etc.</li> </ul> </li> <li><i>Optics-photonics</i></li> <li>Connecting diagnostic equipment</li> <li>Data acquisition</li> <li>Creating customer files from data</li> </ul>

MODULE 11: MANUAL MACHINING AND MECHANICAL ASSEMBLY		CODE: 869 223 45 hours
<b>Expected Behaviour</b>	Conditions for Performance Evaluation	Suggested Approach
To demonstrate the required competency, the students must <b>perform manual machining and</b> <b>mechanical assembly tasks</b> in accordance with the following conditions, criteria and specifications.	<ul> <li>Given: <ul> <li>instructions, drawings, diagrams and work procedures</li> <li>manufacturers' manuals</li> </ul> </li> <li>Using: <ul> <li>metal parts and threaded and unthreaded fasteners</li> <li>tools, equipment and materials</li> <li>measuring and marking-out instruments</li> <li>products</li> <li>individual protection equipment</li> </ul> </li> <li>Referring to course notes <ul> <li>General Performance Criteria</li> </ul> </li> <li>Observance of occupational health and safety rules</li> <li>Observance of work procedures</li> <li>Observance of manufacturers' recommendations</li> <li>Proper use of tools, equipment, instruments and materials</li> <li>Accurate measurements</li> <li>Neat, careful work</li> <li>Proper use of English and French terminology</li> <li>Inclusion of all information in the work procedures</li> <li>Machining and assembly in conformity with requirements of drawings, diagrams and work procedures</li> </ul>	

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
1 Describe the different fasteners.		<ul> <li>Screws, bolts, washers, lock wires, etc.</li> <li>Nomenclature of threads</li> <li>Thread profiles (Imperial and metric systems)</li> <li>Types</li> <li>Shapes</li> <li>Materials</li> <li>Heads</li> <li>Sizes</li> <li>Grades</li> <li>Classifications</li> <li>Uses</li> <li>Etc.</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
<ul> <li>A Locate information needed for the job in drawings, diagrams and work procedures.</li> <li>2 List the advantages of the effective planning and organization of work.</li> </ul>	<ul> <li>Identification of all the necessary information</li> <li>Accurate interpretation of: <ul> <li>drawings and symbols</li> <li>information</li> <li>instructions</li> </ul> </li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Information about: <ul> <li>machining and assembly methods and techniques</li> <li>components</li> <li>parts</li> <li>tools</li> <li>equipment</li> <li>materials</li> <li>products</li> <li>etc.</li> </ul> </li> <li>Instructions and standards</li> <li>Dimensions and tolerances</li> <li>Symbols and codes</li> <li>Abbreviations</li> <li>English and French terminology</li> </ul> <li>Speed <ul> <li>Efficiency</li> <li>Quality of work</li> <li>Savings in time and money</li> <li>Etc.</li> </ul> </li>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
B Plan the work.	<ul> <li>Logical sequence of operations</li> <li>Appropriate selection of: <ul> <li>tools</li> <li>equipment</li> <li>instruments</li> <li>materials</li> <li>products</li> </ul> </li> <li>Compliance with instructions</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Tasks to be performed</li> <li>Methodical organization of work</li> <li>Tools and equipment: <ul> <li>basic hand tools</li> <li>band saws</li> <li>sensitive drill</li> <li>grinder</li> <li>countersinks and bits</li> <li>deburring tools</li> <li>etc.</li> </ul> </li> <li>Materials: <ul> <li>fasteners</li> <li>buffer tools</li> <li>emery cloth</li> <li>etc.</li> </ul> </li> <li>Products: <ul> <li>cutting fluids</li> <li>lubricants</li> <li>greservatives</li> </ul> </li> <li>Methodical, safe disposal</li> <li>Individual protective equipment</li> <li>Work areas: <ul> <li>at a bench or in an aircraft (aerospace)</li> <li>at a bench or in a cabinet (photonics)</li> </ul> </li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
3 Become aware of the need for great precision in performing tasks.		<ul> <li>Observance of quality criteria</li> <li>Factors favouring precision: <ul> <li>clean instruments</li> <li>clean room</li> <li>tools and equipment in good condition</li> </ul> </li> </ul>
<ul> <li>C Prepare for machining and assembly tasks by performing operations such as: <ul> <li>inspecting the part</li> <li>measuring</li> <li>marking out</li> </ul> </li> <li>punching</li> </ul>	<ul> <li>Accurate observation of condition of parts</li> <li>Appropriate choice of instruments for measurements to be taken</li> <li>Accurate readings</li> <li>Accurate interpretation of readings</li> <li>Accurate location of points to be punched</li> <li>Accurate marking out</li> <li>Proper use of marking-out and punching techniques</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Inspection of parts by sight and touch</li> <li>Types of measurements to be taken: <ul> <li>dimensions</li> <li>shapes</li> </ul> </li> <li>Measuring techniques: <ul> <li>measure tape</li> <li>steel rule</li> <li>micrometer</li> <li>vernier</li> <li>etc.</li> </ul> </li> <li>Determination of location of holes on part (measurements and tolerances): <ul> <li>position of holes</li> <li>centring of holes</li> </ul> </li> <li>Techniques for using marking-out instruments and punches: <ul> <li>scribers</li> <li>centre punches</li> <li>etc.</li> </ul> </li> <li>Marking-out and punching techniques</li> </ul>

	Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
4	Recognize defective tools.		<ul><li>Types of defects</li><li>Possible consequences</li></ul>
D	Perform manual machining operations.	<ul> <li>Proper use of machining techniques for the job</li> <li>Observance of dimensions</li> <li>Absence of burrs</li> <li>Clean parts</li> </ul>	<ul> <li>Aerospace</li> <li>Filing, countersinking, counterboring, cutting, drilling, reaming, tapping, threading and sharpening operations</li> <li>Optics-photonics</li> <li>Filing, cutting, drilling, tapping and threading operations</li> <li>Aerospace and optics-photonics</li> <li>Sequence of operations</li> <li>Part properly positioned and held in vise</li> <li>Calculations and adjustments: <ul> <li>cutting speed</li> <li>feed and rpm</li> </ul> </li> <li>Techniques for machining different metals</li> <li>Techniques for vorking with tools and equipment</li> <li>Techniques for using products (cutting fluids)</li> <li>Deburring and cleaning</li> <li>Verification of dimensions</li> <li>Tolerances</li> <li>Individual protection</li> </ul>

	Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
E	Do assemblies requiring fasteners.	<ul> <li>Accurate positioning of parts to be assembled</li> <li>Proper use of assembly methods and techniques</li> <li>Observance of methods of tightening and locking fasteners</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Measurements taken: <ul> <li>dimensions</li> <li>distances between assembly points</li> </ul> </li> <li>Positioning of assembly components and parts</li> <li>Adjustments and tolerances</li> </ul>
F	Check the quality of the work.	<ul> <li>Thorough verification of conformity of machined parts and assembly with requirements</li> <li>Detection of problems</li> <li>Observance of tolerances</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Verifications related to machining: <ul> <li>dimensions</li> <li>shapes</li> <li>condition of surfaces</li> <li>threads</li> </ul> </li> <li>Tolerances</li> <li>Verifications related to assembly: <ul> <li>positioning of assembled parts</li> <li>quality of locking</li> <li>cleanliness</li> <li>appearance</li> </ul> </li> </ul>
G	Tidy up.	<ul> <li>Appropriate storage and cleaning of:</li> <li>tools</li> <li>equipment</li> <li>instruments</li> <li>materials</li> <li>products</li> <li>Clean workstation</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Methodical storage</li> <li>Use of cleaning products and materials</li> <li>Storage and disposal of hazardous and toxic products (WHMIS)</li> </ul>
DULE 12: PREPARING WIRES AND CABLES		CODE: 797 964 60 hours	
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<b>Expected Behaviour</b>	Conditions for Performance Evaluation	Suggested Approach	
To demonstrate the required competency, the students must <b>prepare wires and cables</b> in accordance with the following conditions, criteria and specifications.	<ul> <li>Given: <ul> <li>instructions and standards</li> <li>drawings, diagrams and work procedures</li> </ul> </li> <li>Using: <ul> <li>different types of wires and cables</li> <li>tools, equipment and materials</li> <li>measuring instruments</li> <li>individual protective equipment</li> </ul> </li> <li>Referring to course notes</li> </ul>		
	General Performance Criteria		
	<ul> <li>Observance of occupational health and safety rules</li> <li>Observance of work procedure</li> <li>Observance of manufacturers' recommendations</li> <li>Proper use of tools, equipment, instruments and materials</li> <li>Accurate measurements</li> <li>Speed</li> <li>Neat, careful work</li> <li>Proper use of English and French terminology</li> <li>Inclusion of all information in the work procedures</li> <li>Stripping, crimping and soldering in conformity with standards and requirements of drawings, diagrams and work procedures</li> </ul>		

	Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
1	Distinguish among the colours used in crimping.		<ul> <li>Colour ID code:</li> <li>wires and cables</li> <li>lugs and splices</li> <li>contacts (BIN)</li> <li>tools (jig)</li> <li>Manufacturer's code</li> </ul>
2	Describe the characteristics of wire and cables.		<ul> <li>Definition</li> <li>Shape</li> <li>Appearance</li> <li>Size</li> <li>Composition</li> <li>Use</li> <li>Differentiation among the different cables used, including fibre optic cables</li> </ul>
3	Describe the characteristics of terminals.		<ul> <li>Definition</li> <li>Shape</li> <li>Appearance</li> <li>Size</li> <li>Composition</li> <li>Use</li> <li>Differentiation among the most commonly used lugs, splices and contacts in <i>aerospace</i> or <i>optics-photonics</i></li> </ul>

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Module 12

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
A Locate information needed to do the job in drawings, diagrams and work procedures.	<ul> <li>Identification of all the necessary information</li> <li>Accurate interpretation of:         <ul> <li>drawings and symbols</li> <li>information</li> <li>instructions</li> <li>standards</li> </ul> </li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Information about: <ul> <li>crimping techniques</li> <li>components</li> <li>materials</li> <li>equipment</li> <li>tools</li> <li>etc.</li> </ul> </li> </ul>
B Plan the work.	<ul> <li>Logical sequence of operations</li> <li>Appropriate selection of: <ul> <li>tools</li> <li>equipment</li> <li>instruments</li> <li>materials</li> </ul> </li> <li>Compliance with instructions</li> </ul>	<ul> <li>Tasks to be performed</li> <li>Methodical organization of work</li> <li>Tools and equipment: <ul> <li>cutting tools</li> <li>cutters</li> </ul> </li> <li>Aerospace <ul> <li>stripping tools (manual and automatic)</li> <li>crimping tools (manual or pneumatic)</li> <li>band saw</li> </ul> </li> <li>Optics-photonics <ul> <li>manual stripping tools</li> <li>manual crimping tools</li> </ul> </li> <li>Measuring instruments</li> <li>Materials: <ul> <li>wires</li> <li>cables (including fibre optic cables)</li> <li>lugs</li> <li>splices</li> <li>contacts</li> <li>etc.</li> </ul> </li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
C Cut and strip the wire and cable.	<ul> <li>Determination of lengths to cut and strip</li> <li>Proper use of cutting and stripping techniques for the type of wire or cable</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Determination of length to cut in accordance with: <ul> <li>drawings and diagrams</li> <li>work methods</li> </ul> </li> <li>Determination of length to strip in accordance with: <ul> <li>types of lugs</li> <li>splices and contacts used</li> <li>connectors</li> </ul> </li> <li>Measurements</li> <li>Standards related to cutting and stripping</li> <li>Manufacturers' recommendations</li> <li>Cutting and stripping techniques for wires, cables and fibre optics, as needed</li> <li>Method of working with tools and equipment</li> <li>Individual protection</li> </ul>
D Prepare the crimping tool.	<ul> <li>Appropriate preparation in accordance with gauge of wire, cable and fibre optic, terminals and splices</li> <li>Accurate adjustments</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Ways of preparing the tool in accordance with the wire, cable, fibre optic, terminals and splices: <ul> <li>adjustment and position of selector</li> <li>installation of turret and positioner, as needed</li> <li>etc.</li> </ul> </li> <li>Manufacturers' recommendations</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
E Perform crimping operations.	<ul> <li>Appropriate positioning of: <ul> <li>terminals</li> <li>wire, cable, fibre optic and splices</li> </ul> </li> <li>Proper use of crimping techniques, as needed</li> <li>Solid crimping</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Positioning of lug, splice or contact in accordance with crimping tool and manufacturer's recommendations</li> <li>Positioning of wire, cable or fibre optic in accordance with stripped length and standards related to terminals</li> <li>Crimping techniques</li> <li>Method of working with tools</li> <li>Individual protection</li> <li>Optics-photonics</li> <li>Technique for fusing fibre optics</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
F Check the quality of the crimping.	<ul> <li>Thorough verification of conformity of crimping with standards</li> <li>Thorough verification of conformity of soldering with standards, as needed</li> <li>Observance of tolerances</li> <li>Determination of necessary corrective measures</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Verifications: <ul> <li>location of wire, cable or fibre optic</li> <li>location of crimp</li> <li>presence of code on lugs and certain splices</li> </ul> </li> <li>Detection of problems: <ul> <li>deformations, cracks, twisting, etc.</li> <li>microfractures (optics-photonics)</li> </ul> </li> <li>Tolerances: <ul> <li>solid crimping (disconnect test)</li> <li>positioning of wires, cables or fibre optics</li> </ul> </li> <li>Measurements: <ul> <li>electrical or light continuity, as needed</li> <li>physical resistance of crimping</li> <li>reduction of optical signal (optics-photonics)</li> </ul> </li> </ul>
G Tidy up.	<ul> <li>Appropriate storage and cleaning of: <ul> <li>tools</li> <li>equipment</li> <li>instruments</li> <li>materials</li> </ul> </li> <li>Clean workstation</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Methodical storage</li> <li>Use of cleaning products and materials</li> </ul>

10DULE 13: SOLDERING		CODE: 869 255 75 hours
<b>Expected Behaviour</b>	<b>Conditions for Performance Evaluation</b>	Suggested Approach
To demonstrate the required competency, the students must <b>perform soldering operations</b> in accordance with the following conditions, criteria and specifications.	<ul> <li>Given:         <ul> <li>instructions and standards</li> <li>drawings, diagrams and work procedures</li> </ul> </li> <li>Using:         <ul> <li>different types of wires and cables</li> <li>electrical and electronic components</li> <li>tools, equipment and materials</li> <li>measuring instruments and products</li> <li>individual protective equipment</li> </ul> </li> <li>Referring to course notes</li> </ul>	
	<ul> <li>Observance of health and safety rules</li> </ul>	
	<ul> <li>Observance of work procedure</li> <li>Observance of manufacturers' recommendations</li> <li>Proper use of tools, equipment, instruments and materials</li> <li>Accurate measurements</li> <li>Speed</li> <li>Neat, careful work</li> <li>Proper use of English and French terminology</li> <li>Inclusion of all information in the work procedures</li> <li>Soldered parts in conformity with standards and requirements of drawings, diagrams and work procedures</li> </ul>	

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Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
1 Become aware of the importance of observing standards related to soldering.		<ul> <li>Awareness of the need to consult technical documentation</li> <li>Identification of conditions essential to quality work</li> </ul>
2 Describe the different tools and accessories used in soldering.		<ul> <li>Cutting and stripping tools (see Module 9)</li> <li>Soldering irons: <ul> <li>Ungar 9900</li> <li>Ungar P150</li> </ul> </li> <li>Characteristics: <ul> <li>sizes</li> <li>uses</li> <li>temperature</li> <li>performance</li> <li>power</li> </ul> </li> <li>Accessories: <ul> <li>tips (pyramid, screwdriver)</li> <li>chisel, wedge, gouge</li> <li>anti-drip clamp</li> <li>vises</li> <li>etc.</li> </ul> </li> <li>Uses of irons and tips</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
A Locate information needed for the job in drawings, diagrams and work procedures.	<ul> <li>Identification of all the necessary information</li> <li>Accurate interpretation of: <ul> <li>drawings and symbols</li> <li>information</li> <li>instructions</li> </ul> </li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Information about: <ul> <li>soldering process</li> <li>tools</li> <li>equipment</li> <li>materials</li> </ul> </li> <li>Instructions and standards</li> <li>Technical specifications</li> <li>Dimensions and tolerances</li> <li>Symbols</li> <li>English and French terminology</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
B Plan the work.	<ul> <li>Logical sequence of operations</li> <li>Appropriate selection of: <ul> <li>tools</li> <li>equipment</li> <li>materials</li> <li>products</li> </ul> </li> <li>Compliance with instructions</li> </ul>	Aerospace and optics-photonics <ul> <li>Tasks to be performed</li> <li>Methodical organization of work</li> <li>Tools and equipment:                 <ul> <ul> <li>cutting tools</li> <ul> <li>cutting tools</li> <ul> <li>cutters</li> <ul> <ul> <li>stripping knives</li> <ul></ul></ul></ul></ul></ul></ul></ul></li></ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
C Prepare the wires and cables for soldering.	<ul> <li>Determination of appropriate lengths to cut and strip</li> <li>Proper use of techniques</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Techniques for cutting and stripping cables (see Module 9)</li> <li>Cleaning method</li> <li>Method of determining the length to strip in accordance with: <ul> <li>the parts to be assembled</li> <li>tables</li> </ul> </li> <li>Measurement of lengths (standards and tolerances)</li> <li>Methods of working with tools and equipment</li> <li>Individual protection</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
D Solder wires, cables and electrical and electronic components.	<ul> <li>Observance of standards</li> <li>Observance of length to be soldered</li> <li>Proper use of soldering technique</li> <li>Cleanliness of soldered surfaces</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Determination of the length to tin in accordance with: <ul> <li>the parts to be assembled</li> <li>tables</li> </ul> </li> <li>Types of soldering in accordance with the composition of alloys: percentages of tin and lead</li> <li>Strippers and solvents: <ul> <li>directions for use</li> <li>application at the proper points</li> </ul> </li> <li>Soldering techniques for: <ul> <li>wires and cables</li> <li>electrical and electronic components</li> </ul> </li> <li>Standards</li> <li>Methods of cleaning wires, cables and components</li> <li>Method of working with tools and equipment</li> <li>Individual protection</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
E Solder a joint.	<ul> <li>Observance of sequence of operations</li> <li>Accurate positioning of parts to be soldered</li> <li>Precise application of solder</li> <li>Solid joint</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Positioning and installation of: <ul> <li>wires and cables</li> <li>electrical and electronic components</li> </ul> </li> <li>Quantity of solder</li> <li>Methods of applying heat and solder: <ul> <li>depending on the type of solder</li> <li>at the appropriate points</li> </ul> </li> <li>Method of working with soldering irons and tips</li> <li>Handling of products in conformity with WHMIS rules</li> <li>Standards</li> <li>Individual and collective protection</li> </ul>
F Clean a soldered joint.	<ul> <li>Observance of directions</li> <li>Observance of methods of applying products</li> <li>Shininess of joint</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Cleaning methods in accordance with parts to be cleaned</li> <li>Use of products in conformity with WHMIS rules</li> <li>Individual protection</li> </ul>
G Desolder joints.	<ul> <li>Proper use of desoldering technique</li> <li>Precise, clean work</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Desoldering technique</li> <li>Method of using desoldering tools and materials: pump, iron and wick</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
H Check a soldered joint.	<ul> <li>Thorough verification of conformity of soldered parts with standards</li> <li>Observance of tolerances</li> <li>Determination of necessary corrective measures</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Visual inspection</li> <li>Verifications to be done on joint: <ul> <li>shininess of surface</li> <li>solid joint</li> <li>quantity of solder</li> <li>measurement of distance between sleeve of component and joint</li> </ul> </li> <li>Standards and tolerances</li> <li>Detection of problems such as: <ul> <li>holes</li> <li>scratches</li> <li>surface defects</li> <li>noncompliant setbacks</li> <li>etc.</li> </ul> </li> </ul>
I Tidy up.	<ul> <li>Appropriate storage and cleaning of: <ul> <li>tools</li> <li>equipment</li> <li>instruments</li> <li>materials</li> <li>products</li> </ul> </li> <li>Clean workstation</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Methodical storage</li> <li>Use of cleaning products and materials</li> <li>Storage and disposal of hazardous and toxic products (WHMIS)</li> </ul>

<b>Expected Behaviour</b>	<b>Conditions for Performance Evaluation</b>	Suggested Approach
To demonstrate the required competency, the students must <b>build harnesses</b> in accordance with the following conditions, criteria and specifications.	<ul> <li>Given: <ul> <li>instructions and standards</li> <li>drawings, diagrams and work procedures</li> </ul> </li> <li>Using: <ul> <li>different types of wires and cables</li> <li>fibre optics and electrical and electronic components</li> <li>tools, equipment and materials</li> <li>measuring instruments and products</li> <li>individual protective equipment</li> </ul> </li> <li>Referring to course notes <ul> <li>General Performance Criteria</li> </ul> </li> <li>Observance of health and safety rules</li> <li>Observance of work procedure</li> <li>Observance of manufacturers' recommendations</li> <li>Proper use of tools, equipment, instruments and materials</li> <li>Accurate measurements</li> <li>Speed</li> <li>Neat, careful work</li> </ul> <li>Proper use of English and French terminology</li> <li>Inclusion of all information in the work procedures</li> <li>Harnesses in conformity with requirements of drawings, diagrams and work procedures</li>	

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Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
1 Differentiate among the different types of connectors.		<ul> <li>Aerospace</li> <li>Families of certified connectors: <ul> <li>circular connectors</li> <li>D connectors</li> <li>coaxial connectors</li> </ul> </li> <li>Optics-photonics</li> <li>Fibre optic connectors</li> </ul> <li>Aerospace and optics-photonics <ul> <li>Backshell</li> <li>Characteristics</li> <li>Relationships with: <ul> <li>contacts</li> <li>crimping tools</li> <li>insertion and removal tools</li> </ul> </li> </ul></li>
2 Recognize different terminals used on a harness.		<ul> <li>Aerospace</li> <li>Terminals for: <ul> <li>thermocouples</li> <li>relays</li> <li>terminal blocks</li> <li>breakers</li> </ul> </li> <li>Optics-photonics <ul> <li>power supplies</li> <li>receivers</li> <li>housings</li> <li>etc.</li> </ul> </li> <li>Terminal codes (see Module 9)</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
3 Differentiate among the types of tubing used in harnesses.		<ul> <li>Tubing:</li> <li>rigid</li> <li>flexible</li> <li>heat-shrinkable</li> <li>moulded</li> <li>Characteristics</li> <li>Uses</li> </ul>
4 Differentiate among the types of fasteners and lacing cords used on harnesses.		<ul> <li>Tie wraps</li> <li>Lacing cords</li> <li>Characteristics</li> <li>Uses</li> <li>Precautions</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
A Locate information needed for the job in drawings, diagrams and work procedures.	<ul> <li>Identification of all the necessary information</li> <li>Accurate interpretation of: <ul> <li>drawings and symbols</li> <li>information</li> <li>instructions</li> </ul> </li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Information about: <ul> <li>techniques for building harnesses</li> <li>components</li> <li>equipment</li> <li>tools</li> <li>materials</li> <li>etc.</li> </ul> </li> <li>Techniques for: <ul> <li>coding</li> <li>sizes</li> <li>cutting wires and cables, including fibre optics</li> <li>installing terminals</li> <li>installing tubing</li> </ul> </li> <li>Standards and tolerances</li> <li>Symbols</li> <li>English and French terminology</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
B Plan the work.	<ul> <li>Logical sequence of operations</li> <li>Appropriate selection of: <ul> <li>tools</li> <li>equipment</li> <li>instruments</li> <li>materials</li> <li>products</li> </ul> </li> <li>Compliance with instructions</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Tasks to be performed</li> <li>Methodical organization of work</li> <li>Tools: <ul> <li>basic hand tools</li> <li>cutting tools</li> <li>stripping tools</li> <li>crimping tools</li> <li>insertion and removal tools</li> </ul> </li> <li>Equipment: <ul> <li>printing</li> <li>routing board</li> <li>soldering</li> </ul> </li> <li>Measuring and testing instruments</li> </ul> <li>Aerospace <ul> <li>multimeter</li> <li>etc.</li> </ul> </li> <li>Optics-photonics <ul> <li>powermeter and optical source</li> <li>interferometer</li> <li>optical return loss (ORL)</li> <li>optical spectrum analyzer (OSA)</li> <li>flashlight or laser pen</li> <li>etc.</li> </ul> </li>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
		Aerospace and optics-photonics         • Materials:         - wires and cables, including fibre optics         - connectors         - contacts         - terminals         - tubing         - fasteners and lacing cords         - sleeves, rings and clamps         - nameplates         - etc.         Preservatives         Methodical, safe disposal         Individual protective equipment:         - glasses         - gloves         - uniform (optics-photonics)
5 Explain the nature and purpose of marking.		<ul> <li>Aerospace</li> <li>Background</li> <li>Marking methods: <ul> <li>ink-jet printing</li> <li>laser printing</li> <li>heat stamping</li> <li>etc.</li> </ul> </li> <li>Purpose of marking</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
<ul> <li>C Prepare wires and cables:</li> <li>- cutting</li> <li>- coding</li> </ul> 6 Explain the characteristics of jigs used in building homeses	<ul> <li>Accurate coding of wires and cables</li> <li>Appropriate location of marking</li> <li>Permanent marking</li> <li>Length of wires and cables in conformity with requirements</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Arrangement of markings: <ul> <li>vertical</li> <li>horizontal</li> <li>distance between markings</li> </ul> </li> <li>Identification of wires, cables and harness (coding standards)</li> <li>Use of marking methods (see objective 5)</li> <li>Installation of sleeves, plates, tape</li> <li>Use of sealants</li> <li>Measurements</li> <li>Techniques for cutting wires and cables</li> <li>Tolerances</li> <li>Methods of working with tools and equipment</li> <li>Individual protection</li> </ul>
used in building harnesses.		<ul> <li>Characteristics of jigs: <ul> <li>general characteristics</li> <li>dimensions</li> <li>components</li> <li>related computer equipment</li> <li>manufacturing materials</li> <li>manufacturing processes</li> </ul> </li> <li>Distinction among methods of routing wires and cables on a board</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
D Assemble wires and cables.	<ul> <li>Accurate arrangement of: <ul> <li>wires</li> <li>cables</li> <li>fasteners</li> </ul> </li> <li>Proper use of methods for installing: <ul> <li>fasteners</li> <li>lacing cords</li> </ul> </li> <li>Shape and size of harness in conformity with requirements</li> <li>Accurate coding of harness</li> <li>Solid assembly</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Methods of routing wires and cables: <ul> <li>by segment</li> <li>continuous</li> </ul> </li> <li>Techniques for using a routing jig</li> <li>Types of knots: <ul> <li>halyard</li> <li>reef</li> <li>half hitch</li> <li>double bowline</li> <li>etc.</li> </ul> </li> <li>Methods of installing fasteners on: <ul> <li>the trunk</li> <li>branch-offs</li> <li>fingertype</li> </ul> </li> <li>Lacing techniques: <ul> <li>single cord</li> <li>splices</li> </ul> </li> <li>Methods of working with tools and equipment</li> <li>Verification of solidity of assembly</li> <li>Dimensions</li> <li>Individual protection</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
E Install and remove terminals.	<ul> <li>Proper use of crimping or soldering techniques, as needed</li> <li>Observance of sequence of operations</li> <li>Terminals in conformity with requirements</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Installation of terminals: <ul> <li>stripping of wires and cables</li> <li>crimping of contacts, lugs and splices or soldering, as needed</li> <li>insertion of contacts</li> <li>installation of clamps</li> <li>installation of crimped or soldered terminals</li> <li>assembly of connectors</li> </ul> </li> <li>Disassembly of connectors</li> <li>Removal of terminals: <ul> <li>removal of clamps</li> <li>removal of contacts</li> </ul> </li> <li>Corresponding techniques</li> <li>Methods of working with tools and equipment</li> <li>Dimensions</li> <li>Tolerances</li> </ul>
F Prepare tubing.	<ul> <li>Determination of type of preparation required</li> <li>Proper use of techniques for the type of preparation to be done: <ul> <li>cutting</li> <li>shaping</li> </ul> </li> <li>Length of tubing in conformity with requirements</li> <li>Solid crimp rings, as needed</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Dimensions</li> <li>Techniques for cutting tubing using the appropriate tools</li> <li>Methods of forming rigid tubing</li> <li>Installation of rings for assembly</li> <li>Methods of working with tools and equipment</li> <li>Individual protection</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
G Install tubing.	<ul> <li>Accurate positioning of tubing</li> <li>Observance of installation sequence</li> <li>Proper use of fastening and connecting methods</li> <li>Accurate adjustments</li> <li>Solid installation</li> </ul>	Aerospace and optics-photonics <ul> <li>Positioning of tubing</li> <li>Methods of fastening tubing:                 <ul> <li>fasteners</li> <li>lacing cords</li> </ul> </li> <li>Methods of connecting to a wall</li> </ul> <ul> <li>Adjustments:                     <ul> <li>length of tubing</li> <li>shape</li> <li>location</li> <li>etc.</li> <li>Dimensions</li> </ul> </li> <li>Methods of working with tools and equipment</li> <li>Individual protection</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
H Check the quality of the work.	<ul> <li>Thorough verification of conformity of harness with requirements</li> <li>Observance of tolerances</li> <li>Determination of necessary corrective measures</li> </ul>	Aerospace and optics-photonics         • Verification of:         - assembly and location of terminals         - solidity of contacts         - conformity of solder with requirements         - size of harness and splices         - shape of harness         - shrinking of sleeving         - lacing cords and fasteners         - insulation sleeves and tubing         - clamps         - marking of codes         - cleanliness of harness         • Tolerances         • Detection of problems:         - deformations         - twisting         - etc.
I Tidy up.	<ul> <li>Appropriate storage and cleaning of: <ul> <li>tools</li> <li>equipment</li> <li>instruments</li> <li>materials</li> <li>products</li> </ul> </li> <li>Clean workstation</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Methodical storage</li> <li>Protection of harness and connectors: <ul> <li>ends</li> <li>plastic bags</li> </ul> </li> <li>Use of cleaning products and materials</li> <li>Storage and disposal of hazardous and toxic products (WHMIS)</li> </ul>

Expected Behaviour	Conditions for Performance Evaluation	Suggested Approach
To demonstrate the required competency, the students must <b>assemble and install system</b> <b>components</b> in accordance with the following conditions, criteria and specifications.	<ul> <li>Given: <ul> <li>instructions and standards</li> <li>drawings, diagrams and work procedures</li> </ul> </li> <li>Using: <ul> <li>electrical components and subassemblies</li> <li>actual tools and equipment or simulation benches</li> <li>instruments, materials and products</li> <li>individual protective equipment</li> </ul> </li> <li>Referring to course notes</li> </ul>	
	General Performance Criteria	
	<ul> <li>Observance of occupational health and safety rules</li> <li>Proper use of tools, equipment, instruments and materials</li> <li>Accurate measurements</li> <li>Neat, careful work</li> <li>Proper use of English and French terminology</li> <li>Inclusion of all information in the work procedures</li> <li>Assembly and installation in conformity with requirements of drawings, diagrams and work procedures</li> </ul>	

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
1 Differentiate among the components and subassemblies of a system.		<ul> <li>Components in <i>aerospace:</i> <ul> <li>switches</li> <li>breakers</li> <li>contactors</li> <li>lights</li> <li>relays</li> <li>etc.</li> </ul> </li> <li>Components in <i>optics-photonics</i>: <ul> <li>potentiometer</li> <li>transducer</li> <li>power supply</li> <li>detector</li> <li>signal conditioner</li> <li>coupler</li> <li>etc.</li> </ul> </li> <li>Aerospace and optics-photonics <ul> <li>Subassemblies:</li> <li>instrument panels</li> <li>circuit-breaker panels</li> <li>terminal blocks</li> <li>junction boxes</li> <li>connector panels</li> <li>splice boxes</li> <li>simulators</li> <li>etc.</li> </ul> </li> </ul>

Specifications of the Expected Behaviour and Second-Level ObjectivesSpecific Performance Criteria	Suggested Related Content
<ul> <li>A Locate information needed for the job in drawings, diagrams and work procedures.</li> <li>Identification of all the necessary information</li> <li>Accurate interpretation of: <ul> <li>drawings and symbols</li> <li>information</li> <li>instructions</li> <li>standards</li> </ul> </li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Information about: <ul> <li>techniques for assembling and installing electrical, optical and photonic components and subassemblies</li> <li>equipment</li> <li>tools</li> <li>materials</li> <li>etc.</li> </ul> </li> <li>Techniques for: <ul> <li>coding terminals, components and subassemblies</li> <li>assembling and installing terminals, components and subassemblies</li> <li>positioning holes</li> <li>determining the size of holes and the surface to be treated</li> <li>calculating the resistance between the contacts</li> </ul> </li> <li>Standards and tolerances</li> <li>Symbols</li> <li>English and French terminology</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
B Plan the work.	<ul> <li>Logical sequence of operations</li> <li>Appropriate selection of: <ul> <li>tools</li> <li>equipment</li> <li>materials</li> <li>products</li> </ul> </li> <li>Compliance with instructions</li> </ul>	Aerospace and optics-photonics         • Tasks to be performed         • Methodical organization of work         • Tools:         - basic hand tools         - grounding tools         - crimping tools         - soldering tools         - multimetr         - multimeter         - etc.         • Measuring and testing instruments ( <i>aerospace</i> ):         - milliohmmeter         - multimeter         - etc.         • Measuring and testing instruments ( <i>optics-photonics</i> ):         - powermeter and optical source         - reflectometer         - optical return loss (ORL)         - flashlight or laser pen         - etc.         • Materials:         - fasteners         - lock wires         - terminals         • Products:         - cleaners         - chemical preservatives         • Methodical, safe disposal         • Individual protective equipment:         - glasses         - labels         - gloves         - apron         - mask         - uniform

Specifications of the Expected Behaviour and Second-Level ObjectivesSpecific Performance Criteria	Suggested Related Content
C       Prepare the components to be assembled and installed. <ul> <li>Accurate evaluation of condition of parts</li> <li>Accurate positioning of holes</li> <li>Observance of techniques</li> <li>Observance of dimensions</li> <li>Application of products at the appropriate points</li> <li>Absence of burrs</li> <li> </li></ul> <li> <ul> <li>Absence of burrs</li> <li> </li> </ul> </li>	<ul> <li>crospace and optics-photonics</li> <li>Careful unpacking of parts</li> <li>Inspection by sight and touch</li> <li>Measurements: <ul> <li>location of holes</li> <li>size of holes</li> <li>shape of holes</li> </ul> </li> <li>Techniques: <ul> <li>marking out</li> <li>punching</li> <li>drilling</li> <li>deburring</li> </ul> </li> <li>Preparation of exposed surface: <ul> <li>cleaning</li> <li>application of chemical solution (alodine, irridite)</li> </ul> </li> <li>Methods of applying products: <ul> <li>manual</li> <li>touch-up</li> <li>immersion</li> </ul> </li> <li>Installation of terminals: <ul> <li>crimping</li> <li>soldering</li> <li>etc.</li> </ul> </li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
D Ground components and subassemblies.	<ul> <li>Connections in conformity with requirements:         <ul> <li>direct connections</li> <li>indirect connections</li> </ul> </li> <li>Accurate verification of conformity of values with requirements</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Connections: <ul> <li>direct (metal to metal)</li> <li>indirect (braid, wires, lugs)</li> </ul> </li> <li>Assembly and fastening using fasteners</li> <li>Verification of electrical resistance: <ul> <li>locations</li> <li>values</li> </ul> </li> <li>Application of sealants</li> <li>Individual protection</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
E Assemble the subassemblies of a system.	<ul> <li>Observance of sequence of operations</li> <li>Accurate positioning of parts to be assembled</li> <li>Observance of fastening techniques</li> <li>Accurate adjustments</li> <li>Solid, clean assembly</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Positioning of parts to be assembled</li> <li>Connections using connectors, lugs, etc.</li> <li>Adjustment of components: <ul> <li>depth</li> <li>distance</li> <li>etc.</li> </ul> </li> <li>Fastening techniques: <ul> <li>fasteners</li> <li>torque</li> <li>lock wire</li> <li>etc.</li> </ul> </li> <li>Corresponding techniques</li> <li>Methods of working with tools and equipment</li> <li>Manufacturer's recommendations</li> <li>Dimensions</li> <li>Tolerances</li> <li>Individual and collective protection</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
F Install components and subassemblies.	<ul> <li>Observance of sequence of operations</li> <li>Accurate positioning of components and subassemblies</li> <li>Observance of fastening techniques</li> <li>Accurate adjustments</li> <li>Solid, clean installation</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Positioning of: <ul> <li>components</li> <li>subassemblies</li> </ul> </li> <li>Positioning of parts to be installed</li> <li>Connection using connectors, lugs, etc., between components and subassemblies</li> <li>Adjustment of components and subassemblies: <ul> <li>depth</li> <li>distance</li> <li>etc.</li> </ul> </li> <li>Fastening techniques: <ul> <li>fasteners</li> <li>torque</li> <li>lock wire</li> <li>etc.</li> </ul> </li> <li>Corresponding techniques</li> <li>Methods of working with tools and equipment</li> <li>Manufacturer's recommendations</li> <li>Dimensions</li> <li>Tolerances</li> <li>Individual and collective protection</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
G Code components and subassemblies.	<ul> <li>Accurate coding of: <ul> <li>components</li> <li>subassemblies</li> </ul> </li> <li>Appropriate location of marking</li> <li>Permanent marking</li> </ul>	<ul> <li>Aerospace</li> <li>Arrangement of markings: <ul> <li>vertical</li> <li>horizontal</li> <li>distance between markings</li> </ul> </li> <li>Identification of components and subassemblies (coding standards)</li> <li>Marking techniques: <ul> <li>engraving</li> <li>punching</li> <li>India ink</li> <li>stamping</li> </ul> </li> <li>Aerospace and optics-photonics</li> <li>Installation of plates and adhesive tape</li> <li>Application of sealants</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
H Check the quality of the work.	<ul> <li>Thorough verification of conformity of assembly and installation with requirements</li> <li>Verification of soldering and crimping with respect to standards</li> <li>Observance of tolerances</li> <li>Determination of necessary corrective measures</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Verification of: <ul> <li>assembly</li> <li>installation</li> <li>positioning of components and subassemblies</li> <li>fasteners</li> <li>identification</li> <li>torque</li> <li>lock wires</li> <li>continuity (grounding)</li> <li>soldering</li> <li>cleanliness</li> </ul> </li> <li>Tolerances</li> <li>Detection of problems: <ul> <li>deformations</li> <li>cracks</li> <li>twisting</li> <li>etc.</li> </ul> </li> </ul>
I Tidy up.	<ul> <li>Appropriate storage and cleaning of:</li> <li>tools</li> <li>equipment</li> <li>instruments</li> <li>materials</li> <li>products</li> <li>Clean workstation</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Methodical storage</li> <li>Protection of assembly: <ul> <li>packaging</li> <li>storing</li> </ul> </li> <li>Use of cleaning products and materials</li> <li>Storage and disposal of hazardous and toxic products (WHMIS)</li> </ul>
<b>Expected Behaviour</b>	<b>Conditions for Performance Evaluation</b>	Suggested Approach
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To demonstrate the required competency, the students must <b>install harnesses in an assembly</b> in accordance with the following conditions, criteria and specifications.	<ul> <li>Given:         <ul> <li>instructions and standards</li> <li>drawings, diagrams and work procedures</li> </ul> </li> <li>Using:         <ul> <li>an electrical or fibre optic harness</li> <li>actual equipment or a simulation bench</li> <li>tools, instruments and materials</li> <li>products</li> <li>individual protective equipment</li> </ul> </li> <li>Referring to course notes         <ul> <li>General Performance Criteria</li> </ul> </li> </ul>	
	<ul> <li>Observance of health and safety rules</li> <li>Proper use of tools, equipment, instruments and materials</li> <li>Accurate measurements</li> <li>Observance of time allotted</li> <li>Neat, careful work</li> <li>Proper use of English and French terminology</li> <li>Inclusion of all information in the work procedures</li> <li>Harnesses in conformity with requirements of drawings, diagrams and work procedures</li> </ul>	

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
1 Differentiate among the accessories used to install harnesses.		<ul> <li>Accessories such as:</li> <li>protective grommets</li> <li>supports</li> <li>clamps</li> <li>clips</li> <li>etc.</li> <li>Characteristics</li> <li>Uses</li> </ul>
A Locate information needed for the job in drawings, diagrams and work procedures.	<ul> <li>Identification of all the necessary information</li> <li>Accurate interpretation of: <ul> <li>drawings and symbols</li> <li>information</li> <li>instructions</li> <li>standards</li> </ul> </li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Information about: <ul> <li>techniques for installing harnesses</li> <li>components</li> <li>equipment</li> <li>tools</li> <li>materials</li> <li>etc.</li> </ul> </li> <li>Instructions for: <ul> <li>coding terminals and components</li> <li>installing terminals and components</li> </ul> </li> <li>Standards and tolerances: <ul> <li>combing of harness</li> <li>bending standards</li> <li>bend radius</li> </ul> </li> <li>Symbols</li> <li>English and French terminology</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
B Plan the work.	<ul> <li>Logical sequence of operations</li> <li>Appropriate selection of: <ul> <li>tools</li> <li>equipment</li> <li>instruments</li> <li>materials</li> <li>products</li> </ul> </li> <li>Compliance with instructions</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Tasks to be performed</li> <li>Methodical organization of work</li> <li>Tools: <ul> <li>basic hand tools</li> <li>crimping tools</li> <li>soldering tools</li> <li>grounding tools</li> <li>torque</li> <li>torque wrench</li> <li>etc.</li> </ul> </li> <li>Measuring and testing instruments: <ul> <li>milliohmmeter</li> <li>multimeter</li> <li>powermeter</li> <li>optical source</li> <li>flashlight or laser pen</li> <li>etc.</li> </ul> </li> <li>Materials: <ul> <li>fasteners</li> <li>lock wire</li> <li>connectors</li> <li>terminals</li> <li>fasteners and lacing cords</li> <li>tubing</li> <li>components</li> <li>etc.</li> </ul> </li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
		<ul> <li>Methodical, safe disposal</li> <li>Individual protective equipment: <ul> <li>glasses</li> <li>gloves</li> <li>apron</li> <li>mask</li> <li>uniform</li> </ul> </li> </ul>
C Prepare the harnesses for installation.	<ul> <li>Accurate positioning of holes</li> <li>Observance of techniques</li> <li>Observance of dimensions</li> <li>Application of products at the appropriate points</li> <li>Absence of burrs</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Measurement of holes and their location</li> <li>Techniques</li> <li>Preparation of exposed surface</li> <li>Methods of applying products</li> <li>Installation of terminals: <ul> <li>crimping</li> <li>soldering</li> <li>etc.</li> </ul> </li> </ul>
D Ground harnesses.	<ul> <li>Conformity of connections with requirements: <ul> <li>direct connections</li> <li>indirect connections</li> </ul> </li> <li>Accurate verification of conformity of values with requirements</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Connection: <ul> <li>direct (metal to metal)</li> <li>indirect (braid, wires, lugs)</li> </ul> </li> <li>Assembly and fastening using fasteners</li> <li>Verification of electrical resistance: <ul> <li>locations</li> <li>values</li> </ul> </li> <li>Application of sealants</li> <li>Individual protection</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
E Route harnesses to components and subassemblies.	<ul> <li>Accurate positioning of harness</li> <li>Proper use of techniques</li> <li>Conformity of shape of harness with requirements</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Combing of harness</li> <li>Bending standards</li> <li>Bend radius</li> <li>Corresponding techniques</li> <li>Observance of prescribed path</li> <li>Installation of the necessary tubing</li> <li>Measurement of shape and size of harness</li> <li>Individual protection</li> </ul>
F Connect and fasten harnesses to components and subassemblies.	<ul> <li>Observance of installation sequence</li> <li>Precise connection</li> <li>Observance of fastening techniques</li> <li>Assembly in conformity with requirements</li> <li>Solid assembly</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Installation of terminals and tubing (see Module 11)</li> <li>Arrangement of clamps</li> <li>Positioning of harness</li> <li>Method of connecting the harness to the components and subassemblies</li> <li>Methods of fastening the harness: <ul> <li>cable clamps</li> <li>tie wraps</li> <li>lacing cords and fasteners</li> <li>connectors</li> </ul> </li> <li>Installation of lock wire</li> <li>Corresponding techniques</li> <li>Methods of working with tools and equipment</li> <li>Dimensions</li> <li>Tolerances</li> <li>Individual and collective protection</li> </ul>

S 1	Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
G C	ode harnesses.	<ul> <li>Accurate coding of harnesses</li> <li>Appropriate location of marking</li> <li>Permanent marking</li> </ul>	<ul><li>Aerospace and optics-photonics</li><li>See Module 15</li></ul>
H C	heck the quality of the work.	<ul> <li>Thorough verification of conformity of harness with requirements</li> <li>Observance of tolerances</li> <li>Determination of necessary corrective measures</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Verification of: <ul> <li>assembly and positioning of terminals</li> <li>solidity of contacts</li> <li>conformity of solder with requirements</li> <li>size of harness and splices</li> <li>shape of harness</li> <li>shrinking of tubing</li> <li>solidity of components</li> <li>tubing</li> <li>cable clamps</li> <li>appropriate connection and fastening of harnesses</li> <li>cleanliness of harness</li> <li>location and application of coding</li> </ul> </li> <li>Tolerances</li> <li>Detection of problems: <ul> <li>twisting</li> <li>etc.</li> </ul> </li> </ul>
I Ti	idy up.	<ul> <li>Appropriate storage and cleaning of:</li> <li>tools</li> <li>equipment</li> <li>instruments</li> <li>materials</li> <li>Clean workstation</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Methodical storage</li> <li>Use of cleaning products and materials</li> <li>Storage and disposal of hazardous and toxic products (WHMIS)</li> </ul>

MODULE 17: ASSEMBLING PRINTED CIRCUIT BOARDS		CODE: 798 005 75 hours
Expected Behaviour	Conditions for Performance Evaluation	Suggested Approach
To demonstrate the required competency, the students must <b>assemble printed circuit boards</b> in accordance with the following conditions, criteria and specifications.	<ul> <li>Given:         <ul> <li>instructions and standards</li> <li>drawings, diagrams and work procedures</li> <li>manufacturers' manuals</li> </ul> </li> <li>Using:         <ul> <li>different types and sizes of printed circuit boards and electrical and electronic components</li> <li>tools, equipment and materials</li> <li>measuring instruments and products</li> <li>individual and collective protective equipment</li> </ul> </li> <li>Referring to course notes         <ul> <li>General Performance Criteria</li> </ul> </li> <li>Observance of health and safety rules</li> <li>Observance of work procedure</li> <li>Observance of manufacturers' recommendations</li> <li>Proper use of tools, equipment, instruments and materials</li> <li>Accurate measurements</li> <li>Observance of time allotted</li> <li>Neat, careful work</li> <li>Proper use of English and French terminology</li> <li>Inclusion of all information in the work procedures</li> <li>Printed circuit boards in conformity with standards and requirements of drawings, diagrams and work procedures</li> </ul>	

	Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
1	Recognize different types of printed circuit boards.		<ul> <li>Flex, rigid and rigid flex boards</li> <li>Interconnections of boards: <ul> <li>laminated</li> <li>single-sided</li> <li>double-sided</li> <li>hybrid</li> </ul> </li> <li>Characteristics</li> <li>Uses</li> <li>Quality criteria</li> </ul>
2	Differentiate among the components of printed circuit boards.		<ul> <li>Axial components</li> <li>Nonaxial components</li> <li>Dual-in-line package</li> <li>Power unit</li> <li>Support, etc.</li> <li>Functions of components</li> </ul>
3	Explain the operating principle of an automatic soldering machine.		<ul> <li>Description of flow soldering technique</li> <li>Stages in automatic processing</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
A Locate information needed for the job in drawings, diagrams and work procedures.	<ul> <li>Identification of all the necessary information</li> <li>Accurate interpretation of: <ul> <li>drawings and symbols</li> <li>information</li> <li>instructions</li> <li>standards</li> </ul> </li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Information about: <ul> <li>techniques for assembling components of printed circuits</li> <li>components</li> <li>materials</li> <li>tools</li> <li>equipment</li> <li>etc.</li> </ul> </li> <li>Technical specifications</li> <li>Dimensions and tolerances</li> <li>Symbols</li> <li>English and French terminology</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
B Plan the work.	<ul> <li>Logical sequence of operations</li> <li>Appropriate selection of: <ul> <li>tools</li> <li>equipment</li> <li>instruments</li> <li>materials</li> <li>products</li> </ul> </li> <li>Compliance with instructions</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Tasks to be performed</li> <li>Methodical organization of work</li> <li>Tools: <ul> <li>cutting tools</li> <li>insertion tools</li> <li>removal tools</li> <li>stripping knives</li> <li>wire wrap tools (manual and automatic)</li> </ul> </li> <li>Equipment: <ul> <li>soldering irons</li> <li>soldering bath</li> <li>microscope</li> <li>universal programmer</li> <li>oven</li> </ul> </li> <li>Measuring instruments: <ul> <li>micrometer</li> <li>caliper</li> <li>ruler</li> </ul> </li> <li>Materials: <ul> <li>printed circuit boards</li> <li>fixed and movable components</li> <li>solders</li> <li>supports</li> </ul> </li> <li>Products: <ul> <li>pastes</li> <li>solvents</li> <li>strippers</li> <li>preservatives</li> </ul> </li> </ul>

	Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
			<ul> <li>Individual protective equipment:</li> <li>fitted heat-resistant gloves</li> <li>apron</li> <li>glasses</li> </ul>
4	Recognize the importance of protecting against electrostatic discharge.		<ul> <li>Identification of materials sensitive to electrostatic discharge</li> <li>Identification and purpose of antistatic equipment: <ul> <li>wrist strap</li> <li>carpet</li> <li>lab coats</li> <li>bags for storing parts and assemblies</li> </ul> </li> </ul>
C	Assemble the components of a printed circuit board.	<ul> <li>Observance of assembly sequence</li> <li>Proper use of assembly methods</li> <li>Proper use of bonding method, as needed</li> <li>Accurate positioning of parts to be assembled</li> <li>Precise assembly</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Handling of materials</li> <li>Measurement of: <ul> <li>dimensions</li> <li>distances between components</li> <li>heights</li> </ul> </li> <li>Positioning of components</li> <li>Installation of components</li> <li>Assembly methods (mechanical and bonding): <ul> <li>paste</li> <li>spacer</li> <li>flange</li> </ul> </li> <li>Methods of working with tools</li> <li>Individual protection</li> </ul>

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Module 17

	Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
D	Solder the assembled components.	<ul> <li>Observance of assembly sequence</li> <li>Observance of soldering standards</li> <li>Proper use of assembly methods</li> <li>Accurate positioning of polarized components to be assembled</li> <li>Precise assembly</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Sequence of operations (see Module 12)</li> <li>Method of working with soldering irons and flat tips</li> <li>Soldering technique specific to printed circuit boards: <ul> <li>application of heat and solder to the appropriate locations and over small surfaces</li> <li>heat control</li> <li>quantity of solder</li> </ul> </li> <li>Standards</li> <li>Individual protection</li> </ul>
E	Stamp printed circuit boards.	<ul> <li>Observance of stamping techniques</li> <li>Full and accurate identification of board</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Identification of printed circuit boards: <ul> <li>part numbers</li> <li>serial numbers</li> <li>upgrades</li> </ul> </li> <li>Stamping methods: <ul> <li>ink mix</li> <li>pre-inked stamp</li> <li>overprinting</li> </ul> </li> <li>Date stamping of printed circuit board upgrades</li> <li>Explanation of the concept of rolling-up revision</li> </ul>

	Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
5	Differentiate among the preservatives used on printed circuit boards.		<ul> <li>Composition of preservatives: <ul> <li>acrylic</li> <li>polyurethane</li> <li>epoxy</li> <li>etc.</li> </ul> </li> <li>Features: <ul> <li>heat resistant</li> <li>cold resistant</li> <li>hardness</li> <li>durability</li> <li>etc.</li> </ul> </li> <li>Functions</li> </ul>
F	Apply the preservative to the assembly.	<ul> <li>Observance of methods of applying the preservative</li> <li>Observance of curing times and temperatures</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Points at which to apply the preservative</li> <li>Methods of application: <ul> <li>spray</li> <li>brush</li> </ul> </li> <li>Techniques for using the printed circuit oven</li> <li>Techniques for using tools and equipment</li> <li>Individual and collective protection</li> </ul>

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Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
G Assemble the movable parts on a printed circuit board.	<ul> <li>Observance of assembly sequence</li> <li>Accurate positioning of parts to be assembled</li> <li>Precise assembly</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Movable parts such as: <ul> <li>integrated circuits (memory)</li> <li>extractors</li> <li>power units</li> <li>detectors</li> <li>programmable arithmetic logic (PAL)</li> <li>etc.</li> </ul> </li> <li>Positioning of parts</li> <li>Installation at the appropriate locations</li> <li>Methods of working with tools</li> </ul>
H Wrap wires.	<ul> <li>Wire routed in conformity with requirements</li> <li>Observance of tolerances</li> <li>Precise winding</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Components: <ul> <li>connectors</li> <li>contacts</li> <li>wire wrap</li> <li>etc.</li> </ul> </li> <li>Delicate handling of components</li> <li>Cabling methods in accordance with standards</li> <li>Tolerances</li> <li>Methods of working with tools</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
I Check the quality of the work.	<ul> <li>Thorough verification of conformity of printed circuit boards with standards</li> <li>Observance of tolerances</li> <li>Determination of necessary corrective measures</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Verifications related to soldering: <ul> <li>location of joints</li> <li>shininess of joints</li> <li>solidity of joints</li> <li>sizes</li> <li>finish and appearance</li> </ul> </li> <li>Verifications related to assembly: <ul> <li>positioning of components</li> <li>precise installation</li> </ul> </li> <li>Verifications related to winding: <ul> <li>routing of wire</li> <li>wrapping standards</li> </ul> </li> <li>Tolerances</li> <li>Dimensions</li> </ul>
J Tidy up.	<ul> <li>Appropriate storage and cleaning of: <ul> <li>tools</li> <li>equipment</li> <li>instruments</li> <li>materials</li> </ul> </li> <li>Clean workstation</li> </ul>	<ul> <li>Aerospace and optics-photonics</li> <li>Methodical storage</li> <li>Use of cleaning products and materials</li> <li>Storage and disposal of hazardous and toxic products (WHMIS)</li> </ul>

MODULE 18: MAINTAINING AN ELECT	FRICAL SYSTEM	CODE: 869 295 75 hours
Expected Behaviour	Conditions for Performance Evaluation	Suggested Approach
To demonstrate the required competency, the students must <b>maintain an electrical system</b> in accordance with the following conditions, criteria and specifications.	<ul> <li>Given: <ul> <li>instructions and standards</li> <li>drawings, diagrams and work procedures</li> <li>manufacturers' manuals</li> </ul> </li> <li>Using: <ul> <li>electrical components, parts or subassemblies</li> <li>actual aerospace equipment or simulation benches</li> <li>tools, equipment and materials</li> <li>measuring instruments and products</li> <li>individual and collective protective equipment</li> </ul> </li> <li>Referring to course notes</li> </ul>	
	General Performance Criteria	
	<ul> <li>Observance of health and safety rules</li> <li>Observance of process</li> <li>Observance of manufacturers' recommendations</li> <li>Proper use of tools, equipment, instruments and materials</li> <li>Accurate measurements</li> <li>Observance of time allotted</li> <li>Neat, careful work</li> <li>Proper use of English and French terminology</li> <li>Inclusion of all information in the work procedures</li> <li>Conformity with requirements of drawings, diagrams and work procedures</li> </ul>	

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
1 Distinguish among the different electrical systems in an aircraft.		<ul> <li>Positioning of circuits:</li> <li>power</li> <li>lighting</li> <li>etc.</li> </ul>
A Locate information needed for the job in drawings, diagrams and work procedures.	<ul> <li>Identification of all the necessary information</li> <li>Accurate interpretation of: <ul> <li>drawings and symbols</li> <li>information</li> <li>instructions</li> </ul> </li> </ul>	<ul> <li>Information about: <ul> <li>techniques and standards</li> <li>components</li> <li>materials</li> <li>tools</li> <li>equipment</li> <li>etc.</li> </ul> </li> <li>Instructions for: <ul> <li>tests</li> <li>maintenance methods and techniques</li> </ul> </li> <li>English and French terminology</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
B Plan the work.	<ul> <li>Logical sequence of operations</li> <li>Appropriate selection of: <ul> <li>tools</li> <li>equipment</li> <li>instruments</li> <li>materials</li> <li>products</li> </ul> </li> <li>Compliance with instructions</li> </ul>	<ul> <li>Tasks to be performed</li> <li>Methodical organization of work</li> <li>Tools: <ul> <li>basic hand tools</li> <li>crimping tools</li> <li>soldering tools</li> <li>grounding tools</li> <li>torque</li> <li>torque wrench</li> <li>etc.</li> </ul> </li> <li>Equipment: <ul> <li>testing device</li> <li>marking device</li> </ul> </li> <li>Measuring and testing instruments: <ul> <li>multimeter</li> <li>multimeter</li> <li>megohmmeter</li> <li>etc.</li> </ul> </li> <li>Materials: <ul> <li>wires and cables</li> <li>connectors</li> <li>contacts</li> <li>terminals</li> <li>fasteners</li> <li>marking materials</li> <li>etc.</li> </ul> </li> <li>Products: <ul> <li>cleaners</li> <li>chemical preservatives</li> <li>sealants</li> </ul> </li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
<ul> <li>2 Recognize common causes of defects.</li> <li>C Examine an electrical system.</li> </ul>	<ul> <li>Accurate reading of measurements</li> </ul>	<ul> <li>Individual protective equipment: <ul> <li>glasses</li> <li>labels</li> <li>gloves</li> <li>apron</li> <li>mask</li> </ul> </li> <li>Cut wire <ul> <li>Poor connection</li> <li>Poor grounding</li> <li>Etc.</li> </ul> </li> <li>Use of a simulation board</li> </ul>
	<ul> <li>Accurate interpretation of readings</li> <li>Accurate location of defect</li> </ul>	<ul> <li>Visual inspection</li> <li>Testing techniques</li> <li>Use of measuring instruments: <ul> <li>multimeter</li> <li>milliohmmeter</li> <li>megohmmeter</li> <li>etc.</li> </ul> </li> <li>Measurements</li> <li>Detection of defects</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
D Remove and disassemble an electrical system.	<ul> <li>Observance of removal and disassembly sequence</li> <li>Proper use of work methods</li> <li>Appropriate protection of components</li> </ul>	<ul> <li>Removal of subassemblies and components</li> <li>Disassembly method</li> <li>Disassembly sequence: <ul> <li>removal of fasteners</li> <li>removal of components</li> <li>labelling of components</li> <li>preservation of components</li> </ul> </li> <li>Method of working with tools and equipment</li> <li>Individual protection</li> </ul>
E Ground subassemblies and components.	<ul> <li>Accurate positioning of holes</li> <li>Observance of techniques</li> <li>Proper use of products at the appropriate points</li> <li>Connections in conformity with requirements: <ul> <li>direct connection</li> <li>indirect connection</li> </ul> </li> <li>Accurate verification of conformity of values with requirements</li> </ul>	<ul> <li>Measurements of holes and their locations</li> <li>Techniques</li> <li>Preparation of exposed surface</li> <li>See Module 16</li> <li>Connection: <ul> <li>direct (metal to metal)</li> <li>indirect (braid, wires and lugs)</li> </ul> </li> <li>Assembly and fastening using fasteners</li> <li>Verification of electrical resistance: <ul> <li>locations</li> <li>values</li> </ul> </li> <li>Application of sealants</li> <li>Individual protection</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
F Perform maintenance operations on an aircraft electrical system.	<ul> <li>Determination of maintenance to be done</li> <li>Observance of sequence of operations</li> <li>Proper use of techniques</li> </ul>	<ul> <li>Sequence of maintenance operations</li> <li>Cleaning</li> <li>Minor repairs such as: <ul> <li>replacement of parts</li> <li>replacement of wires, terminals, etc.</li> <li>soldering</li> <li>crimping</li> <li>etc.</li> </ul> </li> <li>Reassembly of components of electrical system and reinstallation in aircraft</li> <li>Work methods and techniques</li> <li>Individual protection</li> </ul>
G Code the components of the electrical system.	<ul> <li>Accurate coding of components</li> <li>Appropriate location of marking</li> <li>Permanent marking</li> </ul>	<ul> <li>Coding of: <ul> <li>wires</li> <li>cables</li> <li>components</li> <li>subassemblies</li> </ul> </li> <li>See Modules 15, 16 and 17, as needed</li> </ul>
H Check the quality of the work.	<ul> <li>Thorough verification of circuit operation</li> <li>Observance of verification methods</li> </ul>	<ul> <li>Testing of an electric circuit:</li> <li>selection of voltage</li> <li>adjustment of intensity</li> <li>start-up of circuit</li> <li>measurements</li> <li>Use of testing device</li> <li>Individual protection</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
I Tidy up.	<ul> <li>Appropriate storage and cleaning of: <ul> <li>tools</li> <li>equipment</li> <li>instruments</li> <li>materials</li> </ul> </li> <li>Clean workstation</li> </ul>	<ul> <li>Methodical storage</li> <li>Use of cleaning products and materials</li> <li>Packaging and storage of assembly, as needed</li> <li>Storage and disposal of hazardous and toxic products (WHMIS)</li> </ul>

MODULE 19: PERFORMING MINOR MAI	INTENANCE OPERATIONS ON AN OPTICS-PHOTONICS	<b>SYSTEM CODE: 798 044 60 hours</b>
<b>Expected Behaviour</b>	Conditions for Performance Evaluation	Suggested Approach
To demonstrate the required competency, the students must <b>perform minor maintenance</b> <b>operations on the components of</b> <b>an optics-photonics system</b> in accordance with the following conditions, criteria and specifications.	<ul> <li>Given: <ul> <li>instructions and standards</li> <li>drawings, diagrams and work procedures</li> <li>manufacturers' manuals</li> </ul> </li> <li>Using: <ul> <li>electro-optic components, parts or subassemblies</li> <li>actual equipment or simulation benches</li> <li>tools, equipment and materials</li> <li>measuring instruments</li> <li>products</li> <li>individual and collective protective equipment</li> </ul> </li> <li>Referring to course notes <ul> <li>General Performance Criteria</li> </ul> </li> <li>Observance of occupational health and safety rules</li> <li>Operation of components in conformity with requirements</li> </ul>	

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
1 Distinguish among the different assemblies in a system.		<ul> <li>Positioning of circuits:</li> <li>splice boxes</li> <li>interconnections</li> <li>optical sources</li> <li>detectors</li> <li>amplifiers</li> <li>monitoring devices</li> <li>power packs</li> <li>etc.</li> </ul>
A Locate information needed for the job in drawings, diagrams and work procedures.	<ul> <li>Identification of all the necessary information</li> <li>Accurate interpretation of: <ul> <li>drawings and symbols</li> <li>information</li> <li>instructions</li> </ul> </li> </ul>	<ul> <li>Information about: <ul> <li>techniques and standards</li> <li>components</li> <li>materials</li> <li>tools</li> <li>equipment</li> <li>etc.</li> </ul> </li> <li>Instructions for: <ul> <li>tests</li> <li>maintenance methods and techniques</li> </ul> </li> <li>English and French terminology</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
B Plan the work.	<ul> <li>Logical sequence of operations</li> <li>Appropriate selection of: <ul> <li>tools</li> <li>equipment</li> <li>instruments</li> <li>materials</li> <li>products</li> </ul> </li> <li>Compliance with instructions</li> </ul>	<ul> <li>Tasks to be performed</li> <li>Methodical organization of work</li> <li>Tools: <ul> <li>basic hand tools</li> <li>crimping tools</li> <li>soldering tools</li> <li>grounding tools</li> <li>torque</li> <li>torque wrench</li> <li>etc.</li> </ul> </li> <li>Equipment: <ul> <li>testing device</li> <li>Measuring and testing instruments:</li> <li>multimeter</li> <li>moghmmeter</li> <li>powermeter and optical source</li> <li>reflectometer</li> <li>optical return loss (ORL)</li> <li>reflow oven</li> <li>interferometer</li> <li>optical spectrum analyzer (OSA)</li> <li>etc.</li> </ul> </li> <li>Materials: <ul> <li>wires and cables</li> <li>fibre optics</li> <li>contacts</li> <li>terminals</li> <li>fasteners</li> </ul> </li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
C. Inspect photonic, optical and electro-optical systems.	<ul> <li>Visual inspection appropriate to the condition of the system</li> <li>Accurate measurement of components</li> <li>Accurate interpretation of readings</li> <li>Accurate location of defect</li> </ul>	<ul> <li>marking materials <ul> <li>etc.</li> </ul> </li> <li>Products: <ul> <li>cleaners</li> <li>chemical preservatives</li> <li>sealants</li> </ul> </li> <li>Methodical, safe disposal</li> <li>Individual protective equipment: <ul> <li>glasses</li> <li>labels</li> <li>gloves</li> <li>apron</li> <li>mask</li> <li>uniform</li> </ul> </li> <li>Use of cabinet or console</li> <li>Visual inspection</li> <li>Testing techniques</li> <li>Use of measuring instruments: <ul> <li>multimeter</li> <li>milliohmmeter</li> <li>powermeter and optical source</li> <li>reflectometer (OTDR)</li> <li>optical spectrum analyzer (OSA)</li> <li>etc.</li> </ul> </li> </ul>

Sj E	pecifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
D Re sys	emove and disassemble the stem.	<ul> <li>Observance of removal and disassembly sequence</li> <li>Proper use of work methods</li> <li>Appropriate protection of components</li> </ul>	<ul> <li>Removal of subassemblies and components</li> <li>Disassembly method</li> <li>Disassembly sequence: <ul> <li>removal of fasteners</li> <li>removal of components</li> <li>labelling of components</li> <li>protection of components</li> </ul> </li> <li>Method of working with tools and equipment</li> <li>Individual protection</li> </ul>
E Gr cor	round subassemblies and mponents.	<ul> <li>Accurate positioning of holes</li> <li>Observance of work techniques</li> <li>Proper application of products at the appropriate points</li> <li>Connections in conformity with requirements: <ul> <li>direct connection</li> <li>indirect connection</li> </ul> </li> <li>Accurate verification of conformity of values with requirements</li> </ul>	<ul> <li>Measurement of holes and their location</li> <li>Techniques</li> <li>Preparation of exposed surface</li> <li>See Module 8</li> <li>Connection: <ul> <li>direct (metal to metal)</li> <li>indirect (strap, wires and lugs)</li> </ul> </li> <li>Assembly and fastening using fasteners</li> <li>Verification of electrical resistance: <ul> <li>locations</li> <li>values</li> </ul> </li> <li>Application of sealants</li> <li>Individual protection</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
F Perform maintenance operations on a photonics system.	<ul> <li>Determination of maintenance to be done</li> <li>Observance of sequence of operations</li> <li>Proper use of techniques</li> <li>Application of preventive measures related to laser sources</li> </ul>	<ul> <li>Sequence of maintenance operations</li> <li>Cleaning</li> <li>Minor repairs such as: <ul> <li>replacement of parts</li> <li>replacement of wires, terminals, etc.</li> <li>soldering</li> <li>crimping</li> <li>solder reflow</li> <li>etc.</li> </ul> </li> <li>Reassembly of components of electrical system and reinstallation in cabinet or console</li> <li>Work methods and techniques</li> <li>Individual protection</li> </ul>
G Code the components of the system.	<ul> <li>Accurate coding of components</li> <li>Appropriate location of marking</li> <li>Permanent marking</li> </ul>	<ul> <li>Coding of:</li> <li>wires</li> <li>cables</li> <li>characterization</li> <li>components</li> <li>subassemblies</li> </ul>
H Check the quality of the work.	<ul> <li>Thorough verification of operation of circuits</li> <li>Observance of verification methods</li> </ul>	<ul> <li>Testing of system:</li> <li>selection of wavelength</li> <li>adjustment of frequency</li> <li>start-up of circuit</li> <li>measurement</li> <li>Use of testing devices</li> <li>Individual protection</li> </ul>

Specifications of the Expected Behaviour and Second-Level Objectives	Specific Performance Criteria	Suggested Related Content
I Tidy up.	<ul> <li>Appropriate storage and cleaning of: <ul> <li>tools</li> <li>equipment</li> <li>instruments</li> <li>materials</li> </ul> </li> <li>Clean workstation</li> </ul>	<ul> <li>Methodical storage</li> <li>Use of cleaning products and materials</li> <li>Packaging and storage of assembly, as needed</li> <li>Storage and disposal of hazardous and toxic products (WHMIS)</li> </ul>

Expected Outcome	Instructional Guidelines	Suggested Approach
By participating in the required activities of the learning context according to the indicated criteria, the students will be able to <b>use job search techniques.</b> Specifications: Consult various sources of information. Prepare documents for their job search. Plan a job search. Contact prospective employers.	<ul> <li>Provide the students with the material resources and examples that will help them with their work.</li> <li>Explain to the students how to use reference materials.</li> <li>Put the students in touch with resource persons who can help them with their job search.</li> <li>Allot enough time and provide the necessary means for the students to try out their job search plan.</li> <li>Follow up the steps taken by the students.</li> <li>Encourage discussion and cooperation among the students.</li> <li>Organize simulation activities and provide the students with support.</li> </ul>	

Learning Context (first- and second-level operational objectives)	Participation Criteria	Suggested Related Content
PHASE 1         Preparing the Job Search         1       Distinguish among various types		• With a single person
of selection interviews.		<ul><li>Before a committee</li><li>With scenarios</li><li>With other candidates</li></ul>
A Becoming familiar with various sources of information that can be used before and while preparing documents for the job search.		<ul> <li>Material resources, such as: <ul> <li>sample résumés and letters</li> <li>reference books and other documents</li> <li>Scott's</li> <li>NOC</li> <li>monographs</li> <li>REPÈRE (index to French-language periodicals)</li> </ul> </li> <li>Human resources, such as: <ul> <li>guidance services</li> <li>placement services</li> <li>reception and referral services</li> <li>employment centres</li> </ul> </li> </ul>

	Learning Context (first- and second-level operational objectives)		Participation Criteria		Suggested Related Content
B	Writing a résumé and a cover letter.	•	Write a résumé and cover letter containing the relevant information, in accordance with the rules of presentation.	•	Content of a résumé: - work experience - training and competencies - personal information - activities Content of a cover letter Rules for writing and formatting these documents
C	Participating in a simulated job interview.	•	Participate in activities.	•	Attitudes and behaviours to adopt during an interview
	PHASE 2 Preparing and Following a Job Search Plan				
2	Describe job search techniques.			• • • • •	Research in employment centres Consultation of magazines and newspapers Queries to professional corporations, businesses, etc. Use of recruitment and placement agencies Personal contacts Consultation of job lists and employer directories Collection of information about jobs and companies

	Learning Context (first- and second-level operational objectives)	Participation Criteria	Suggested Related Content		
3	Explain the extent to which characteristics of the job market can influence their job search.		<ul> <li>Negative aspects of the job market: <ul> <li>unemployment</li> <li>competition</li> <li>mobility</li> <li>specialized training</li> <li>technological developments</li> <li>economic instability</li> </ul> </li> <li>Positive aspects of the job market: <ul> <li>new jobs</li> <li>growing employment</li> <li>job creation</li> <li>business development</li> <li>working conditions</li> <li>schedules</li> <li>salaries</li> </ul> </li> </ul>		
4	Indicate the attitudes and behaviour that make it easier to approach prospective employers.		• Attitudes and behaviours to adopt when requesting an interview		
D	Determining the types of establishments that correspond to their expectations and values.	• List three types of establishments that could meet their expectations.	<ul> <li>Definition of their expectations and values</li> <li>Establishment of criteria for selecting a job</li> </ul>		
E	Planning the steps involved in the job search plan.		<ul> <li>Determination of steps</li> <li>Determination of order of steps</li> <li>Identification of procedures for each step</li> </ul>		
	Learning Context (first- and second-level operational objectives)		Participation Criteria		Suggested Related Content
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F	Carrying out the steps of the job search plan.			•	Contacts with employers by telephone, mail, personal visits, etc.
G	Keeping a log of the various steps of the job search and the procedure followed.	•	Submit a log containing information on each of the steps in their job search plan, as well as a description of the job search itself.	•	<ul> <li>Record of information such as:</li> <li>people contacted</li> <li>resources consulted</li> <li>information gathered</li> <li>means used</li> </ul>
	PHASE 3 Evaluating Job Search Techniques				
Η	Presenting the results of the techniques used at a group meeting, referring to their log.	•	Give a brief presentation on the relevance of the reference materials used in their job search and the effectiveness of their approach.		

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Module 20

MODULE 21: PRACTICUM IN THE WOR	CODE: 869 224 60 hours	
Expected Outcome	Instructional Guidelines	Suggested Approach
By participating in the required activities of the learning context according to the indicated criteria, the students will be able to <b>enter the work force.</b> Specifications: Become familiar with the workplace. Obtain a position in a workplace. Become aware of how their practicum will affect their perception of the work environment, trade practices, and their aptitudes, preferences, expectations and training.	<ul> <li>Provide the students with the necessary sources of information.</li> <li>Suggest two or three practicum positions for each student.</li> <li>Maintain close ties between the school and the company.</li> <li>Make sure that the companies provide the students with conditions favourable to the performance of practicum-related activities.</li> <li>Make sure that the trainees are supervised by a responsible employee of the company.</li> <li>Ensure regular support and supervision of the students.</li> <li>Intervene if difficulties or problems arise.</li> <li>Encourage the students to take part in discussions and to express themselves.</li> </ul>	

Learning Context (first- and second-level operational objectives)	Participation Criteria	Suggested Related Content
PHASE 1 Preparing for the Practicum		
A Becoming familiar with information about the practicum and the related terms and conditions.	• Consult sources of information at their disposal.	• Objectives of the practicum, duration, instructional guidelines, participation criteria
B Looking for information on possible practicum positions.		<ul> <li>Information such as:</li> <li>the type of company</li> <li>the size of the company</li> <li>the location of the company</li> <li>the products manufactured</li> <li>the working conditions</li> </ul>

Learning Context (first- and second-level operational objectives)	Participation Criteria	Suggested Related Content
PHASE 2         Observing and Practising the         Trade in the Workplace         1       Describe the points to record during a practicum.		<ul> <li>Job market potential: <ul> <li>new jobs, employment growth</li> <li>job creation, business development</li> </ul> </li> <li>Working conditions: schedules, salaries, health and safety, etc.</li> <li>Job market constraints: unemployment, competition, mobility, training, specialties, technological developments, instability, economy</li> </ul>
2 Describe the behaviour to adopt in the workplace.		<ul> <li>Attentive, observant attitude</li> <li>Observance of health and safety rules</li> <li>Tact and discretion, confidentiality</li> <li>Positive behaviour</li> <li>Full, clear and accurate communication</li> <li>Interest in new work experiences</li> <li>Concern for excellence</li> <li>Sense of productivity</li> </ul>
C Observing the work environment.		<ul> <li>Socioeconomic sector</li> <li>Structure</li> <li>Equipment</li> <li>Technological developments</li> <li>Working conditions and labour relations</li> </ul>

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Module 21

	Learning Context (first- and second-level operational objectives)		Participation Criteria		Suggested Related Content
D	Observing cable and circuit assemblers at work.	•	Observe the company's work schedules, policies concerning the activities they are authorized to carry out as trainees, professional ethics and occupational health and safety rules.	•	Observation of various trade-related tasks
E	Performing or helping perform various trade-related tasks.			•	Performance of various tasks according to instructions Observance of occupational health and safety rules
F	Producing a brief report describing their observations of the work environment and of the tasks performed in the company.	•	Produce a report containing their observations on at least five aspects of the work environment and the tasks carried out during the practicum.		

	Learning Context (first- and second-level operational objectives)	Participation Criteria	Suggested Related Content
	PHASE 3 Comparing Initial Perceptions With the Actual Work Environment		
1	List their aptitudes, preferences and expectations.		<ul> <li>Aptitudes: <ul> <li>manual</li> <li>intellectual</li> </ul> </li> <li>Preferences: <ul> <li>individual or team work</li> <li>sector (mechanical manufacturing: aerospace and optics-photonics)</li> <li>tasks</li> </ul> </li> <li>Expectations: <ul> <li>personal</li> <li>occupational</li> </ul> </li> </ul>
G	Identifying aspects of the trade that are similar to and that differ from their training.	• Discuss with their classmates their experiences in the workplace.	<ul> <li>Aspects such as:</li> <li>tasks and operations</li> <li>conditions for performing tasks</li> <li>expected performance</li> </ul>
H	Comparing their perception of the trade before and after the practicum.		• Comparison of their perception of the trade before and after the practicum in terms of the work environment, occupational practices, etc.
I	Determining how their experiences will affect their career choice.		• Influence with respect to their aptitudes, preferences and expectations.

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Module 21

Learning Context (first- and second-level operational objectives)	Participation Criteria	Suggested Related Content
J Commenting on their experience in each practicum position.		
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