Vocational Education Program

5781

Automated Systems Electromechanics

Training Sector

9 Electrotechnology

Reach for your Dreams

Québec

vocational Education Program

5781

Automated Systems Electromechanics

Traning Sector

9 Electrotechnology

Formation professionnelle et technique
et formation continue

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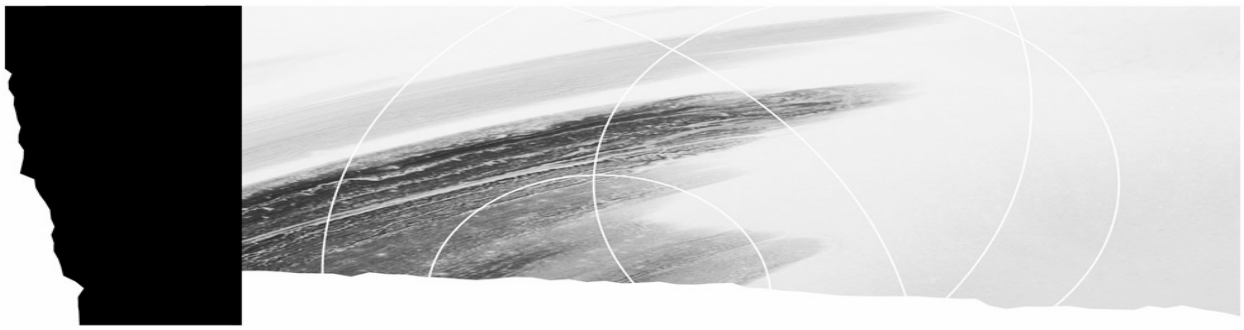


5781	**Automated Systems Electromechanics**

Year of approval: 2003

Certification:	Diploma of Vocational Studies
Number of credits:	120
Number of modules:	27
Duration in hours:	1800 hours

To be admitted to the *Automated Systems Electromechanics*, 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 and the SPR 06 test in the language of instruction and MTH-4068-1, or their equivalents, are prescribed as functional prerequisites.

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.

Introduction

This program of study is based on the vocational education curriculum supported jointly by the Ministère de l'Éducation, which develops the program and defines the guidelines for teaching it, and the educational institutions, which implement the program and the evaluation process. Programs of study include compulsory objectives and suggestions for competency-related knowledge that are given for information purposes only.

Programs of study provide teachers with the frame of reference for planning teaching activities. They define the scope of teaching strategies by identifying the broad educational orientations to be favoured and the objectives to be attained. Successful completion of the program qualifies graduates to practise the trade with the competencies required by the workplace, while the content of their learning activities provides them with a certain degree of versatility.

The duration of the program is 1 800 hours, including 720 hours spent on the specific competencies required to practise the trade and 1 080 hours on more general, work-related competencies. The program of study is divided into 27 modules, which vary in length from 15 to 120 hours. The time allocated to the program is to be used not only for teaching but also for evaluation and remedial work.

Title	Code	Module	Hours	Credits
The Trade and the Training Process	781 621	1	15	1
Health and Safety	754 992	2	30	2
Using Computers	781 632	3	30	2
Checking Electrical Circuits	781 648	4	120	8
Drawing Sketches	781 652	5	30	2
Performing Manual Machining Operations	781 667	6	105	7
Moving Equipment	781 672	7	30	2
Cutting and Welding	781 685	8	75	5
Connecting Conduits	781 692	9	30	2
Industrial Electronics Circuits	781 707	10	105	7
Using Machine Tools	781 716	11	90	6
Analyzing Logic Circuits	781 726	12	90	6
Conventional Alignment	781 732	13	30	2
Maintaining Mechanical Devices	781 747	14	105	7
Assembling Pneumatic Circuits	781 755	15	75	5
Assembling Hydraulic Circuits	781 764	16	60	4
Maintaining Motor Circuits	781 777	17	105	7
Maintaining Pneumatic and Hydraulic Equipment	781 784	18	60	4
Calibrating a Control Loop	781 794	19	60	4
Maintaining Electropneumatic and Electrohydraulic Circuits	781 804	20	60	4
Programming Controllers	781 816	21	90	6
Electronic Motor Control Devices	781 824	22	60	4
Job Search Techniques	781 831	23	15	1
Installing an Automated System	781 847	24	105	7
Planned Maintenance	781 853	25	45	3
Troubleshooting Automated Systems	781 866	26	90	6
Entering the Work Force	781 876	27	90	6

Glossary

Program

A program of study comprises compulsory objectives and content, and may also comprise suggestions for objectives and content that must be enriched and adapted to the students' needs (Education Act, section 461). In this program, the indicative content is expressed in terms of suggestions.

Competency

A competency is the ability to act, succeed and make progress in order to correctly perform work-related tasks or activities. It is based on a set of integrated skills and knowledge pertaining to various fields, perceptions and attitudes.

Objectives

The objective indicates precise requirements for acquiring the operational aspect of the competency, and, in practical terms, for educational and evaluation activities. These objectives are defined as behavioural or situational.

The objective also provides indicators for learning activities related to acquiring the competency. These indicators are described in the elements of the competency in the case of a behavioural objective, and in the phases of the learning context in the case of a situational objective. Suggestions for competency-related knowledge are not prescriptive.

1. Behavioural Objective

A behavioural objective is a relatively closed objective that describes the actions and results expected of the student. Behavioural objectives consist of the following four components:

- The *statement of the competency* results from the work situation analysis, the general goals of the program and other possible factors.

- The *elements of the competency* describe the essential aspects of the competency in terms of specific behaviours and thus ensure a better understanding of the expected outcome. The elements list the major steps in performing a task; in other words, they are the main components of the competency.

- The *achievement context* corresponds to the practical situation for demonstrating the competency when entering the workplace. The context does not aim to describe conditions for learning or evaluation activities.

- *The performance criteria* define the requirements for each of the elements and ensure a more enlightened decision on whether the competency has been acquired. When they are given for the overall competency and are not linked to a specific element, they describe the requirements for performing a task or activity and indicate the expected level of performance or the overall quality of a product or service. In this case, they are attached to the competency as a whole or to several elements of the competency.

Evaluation is based on expected results.

2. Situational Objective

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. Situational objectives consist of the following five components:

- The *statement of the competency* results from the work situation analysis, the general goals of the program and other possible factors.

- The *elements of the competency* 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
  – participation
  – evaluation

- The *instructional guidelines* suggest 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.

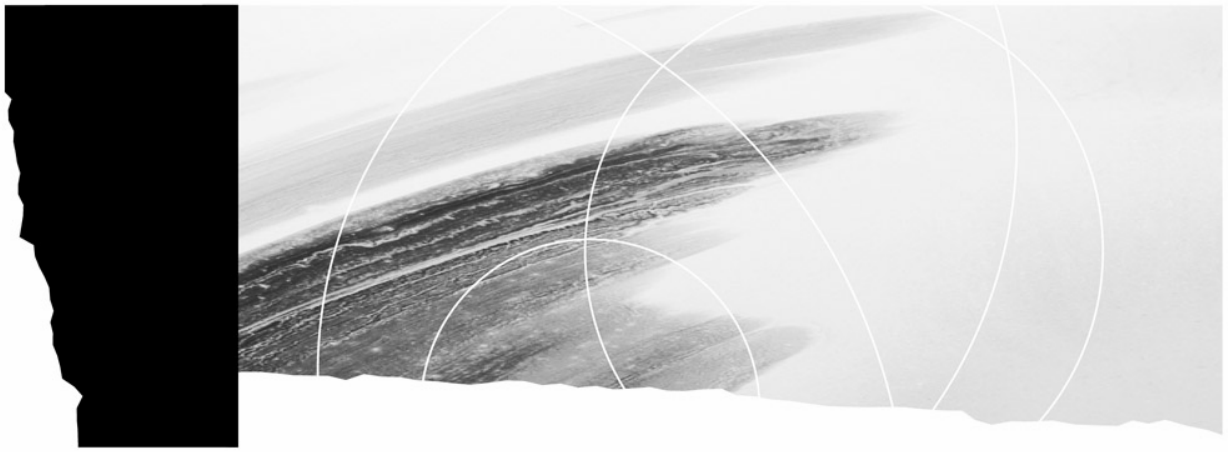
Evaluation is based on the student's participation in the activities of the learning context.

Module

A module is a component part of a program of study comprising a prescriptive objective and suggestions for competency-related knowledge.

Credit

A credit is 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

Program Goals

Educational Aims

Program Competencies and Grid of Learning Focuses

Harmonization

Program Goals

The *Automated Systems Electromechanics* program prepares students to practise the trade of electromechanical technician.

Electromechanical technicians assemble, install, maintain and repair automated production equipment and building mechanics equipment. More specifically, they repair motors, valves, pumps, hydraulic equipment, transmission components, ball bearings and automated control systems.

Electromechanical technicians may also perform other tasks; for example, they may participate in projects, inspect equipment, adjust or calibrate instruments, design parts, make changes to existing systems and participate in annual shutdowns.

Electromechanical technicians work for small, medium-size and large companies, including multinationals, in a variety of sectors such as equipment sales and after-sales service; maintenance; the food industry; pharmaceutical manufacturing; energy production; manufacturing (wood, rubber and plastic products); communications (books and newspapers); and transportation (e.g. subway maintenance).

The work is tiring because of the noise, odours and heat, not to mention the stress associated with the necessary shutdowns, for which the electromechanical technician is responsible. Depending on the work to be done, these technicians work alone or in teams.

Automated Systems Electromechanics is subject to a number of standards and regulations depending on the production sector in question.

The educational goals of the program *Automated Systems Electromechanics* are based on the general goals of vocational education. These goals are:

To develop effectiveness in the practice of a trade.
- To teach students to perform tasks and activities correctly and at an acceptable level of competence for entry into the job market.
- To prepare students to progress satisfactorily on the job.

To foster integration into the work force.
- To familiarize students with the specialization they have chosen.

To foster the development of occupational knowledge.
- To help students:
  - develop autonomy and the desire to learn
  - acquire effective work methods
  - understand the principles underlying the techniques and the technology used in the trade
  - develop self-expression, initiative and an analytical mind
  - acquire the attitudes required to successfully practise the trade
  - acquire a sense of responsibility and concern for excellence

To ensure job mobility.
- To help students develop positive attitudes toward change.

The program meets two requirements of vocational education, i.e. versatility and the capacity to perform the tasks of the trade. Versatility is ensured through several general competencies that enable students to acquire the knowledge and skills required by the trade. The attainment of specific competencies enables them to successfully perform networking tasks. Both types of competencies cover all areas of employment and ensure job mobility.

Educational Aims

Educational aims are based on important values and preoccupations and serve as guidelines when interacting with students. As a general rule, they concern important aspects of professional and personal development that have not been explicitly formulated in the program goals and objectives. They can focus on aspects such as attitudes, work habits and intellectual skills.

Educational aims encourage teachers to give a certain direction to their interactions with students when the occasion arises. They are of a continuous nature and, more specifically, help students to develop habits, attitudes and other aspects beyond the scope of the program objectives.

The *Automated Systems Electromechanics* program encourages students to:

- develop a desire to maintain their professional competence
- develop an interest in using new equipment, technologies and work methods
- develop the ability to manage stress
- develop a sense of responsibility
- develop a concern for observing safety measures

Program Competencies and Grid of Learning Focuses

List of competencies

- Determine their suitability for the trade and the training process.
- Protect health, safety and physical integrity on construction sites.
- Manage computerized data.
- Check an electrical circuit.
- Draw sketches.
- Perform manual machining operations.
- Move industrial equipment.
- Cut and weld metal.
- Connect tubes, pipes and hoses.
- Operate an industrial electronics circuit.
- Use machine tools.
- Analyze a logic circuit.
- Align shafts.
- Maintain mechanical devices.
- Assemble a pneumatic circuit.
- Assemble a hydraulic circuit.
- Maintain an AC or DC motor circuit.
- Maintain pneumatic and hydraulic equipment.
- Calibrate a control loop.
- Maintain electropneumatic and electrohydraulic circuits.
- Program a controller.
- Activate an electronic motor control device.
- Use job search techniques.
- Install an automated system.
- Implement a planned maintenance program.
- Troubleshoot an automated system.
- Enter the work force.

Grid of learning focuses

The grid of learning focuses lists general, work-related competencies and specific competencies required to practise the trade, as well as the major steps in the work process.

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 (△) indicates a correlation between a specific competency and a step in the work process. The symbol (❍) 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 presents the specific competencies in the order in which they should be taught. 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

AUTOMATED SYSTEMS ELECTROMECHANICS

SPECIFIC COMPETENCIES	Competency number	Objective	Duration (in hours)	GENERAL COMPETENCIES																	WORK PROCESS							
				Determine their suitability for the trade and the training process	Protect health, safety and physical integrity on construction sites	Manage computerized data	Check an electrical circuit	Draw sketches	Perform manual machining operations	Move industrial equipment	Cut and weld metal	Connect tubes, pipes and hoses	Operate an industrial electronics circuit	Use machine tools	Analyze a logic circuit	Align shafts	Assemble a pneumatic circuit	Assemble a hydraulic circuit	Program a controller	Activate an electronic motor control device	Use job search techniques	Interpret instructions, drawings and technical manuals	Plan the work	Check the work	Make a diagnosis	Replace or repair parts	Check the overall operation	Record actions and modifications	Tidy up the work area and clean and store equipment
Competency number				1	2	3	4	5	6	7	8	9	10	11	12	13	15	16	21	22	23								
Objective				S	S	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	S								
Duration (in hours)				15	30	30	120	30	105	30	75	30	105	90	90	30	75	60	90	60	15								
Maintain mechanical devices	14	C	105	)	#	#		#	#	#	)	)		#		#						%	%	%	%	%	%	%	%
Maintain an AC or DC motor circuit	17	C	105	)	#	#	#	)		)		)	)		)	)						%	+	%	%	%	%	%	%
Maintain pneumatic and hydraulic equipment	18	C	60	)	#	#	#	)	#	#	)	#	)	)		#	#	#				%	%	%	%	%	%	%	%
Calibrate a control loop	19	C	60	)	#	#	#	#	)			)	#		)		)					%	%	+	+	+	%	%	%
Maintain electropneumatic and electrohydraulic circuits	20	C	60	)	#	#	#	)	)			#	#	)	#		#	#				%	+	%	%	%	%	%	%
Install an automated system	24	C	105	)	#	#	#	#	#	#	#	#	#	#	)	#	#	#	#	#		%	%	%	+	+	%	+	%
Implement a planned maintenance program	25	C	45	)	#	#	#	)	#	)	)	#	#	#	#	#	#	#				%	%	%	%	%	%	%	%
Troubleshoot an automated system	26	C	90	)	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#		%	%	%	%	%	%	%	%
Enter the work force	27	S	90	)	#	)	)	)	)	)	)	)	)	)	)	)	)	)	)	)	#	+	+	+	+	+	+	+	+

Harmonization

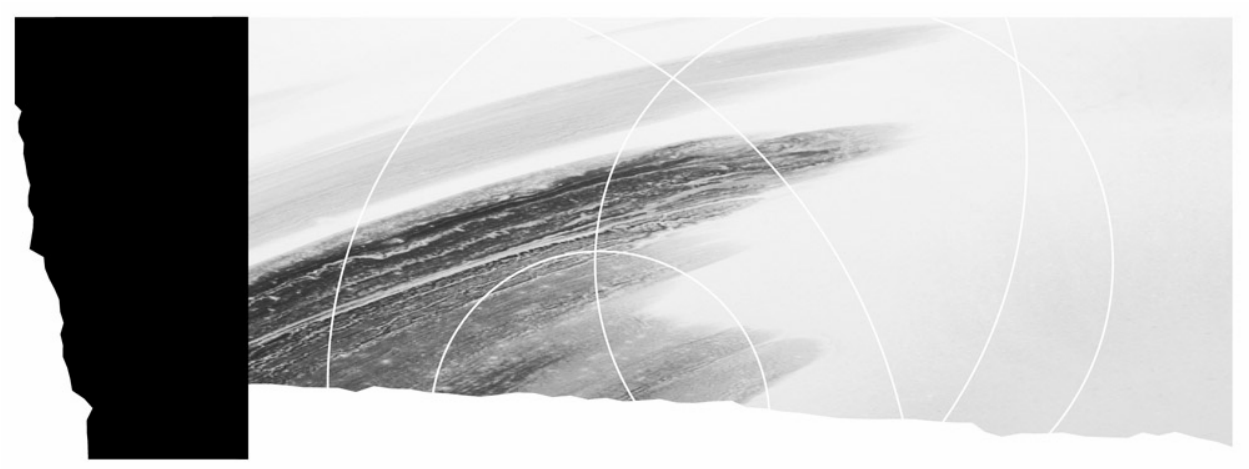
The Ministère de l'Éducation harmonizes vocational and technical programs in order to establish similarities and continuity between secondary- and college-level programs. Harmonization also establishes correlations between programs of study at the same educational level. Regardless of whether the harmonization be inter- or intra-level or in the same or different fields of study, its purpose is to acknowledge the competencies acquired in order to facilitate the training process.

Harmonization contributes to establishing coherence between training programs and is especially important in ensuring that the tasks of the trade or occupation are clearly identified and described. Harmonization makes it possible to identify work-related tasks requiring competencies that are common to more than one program. Even if there are not common competencies, training programs are still harmonized.

Harmonization is inter-level when it focuses on training programs of different levels, is intra-level when it focuses on programs within the same educational level, and is inter-sector when carried out between programs of various training sectors.

An important aspect of harmonization is the updating, when necessary, of the recognition of common competencies. Competencies that are shared by more than one training program and which, once acquired, can be recognized for one program or another are said to be common. Competencies with exactly the same statement and elements are said to be identical. When common competencies are not identical but have enough similarities to be of equal value, they are said to be equivalent.

Harmonization work carried out in the *Automated Systems Electromechanics* program has resulted in identifying competencies that are common with other training programs. Detailed information on this work and its results are presented in the document entitled *Tableaux d'harmonisation Électromécanique de systèmes automatisés.*



Part II

Objectives

The Trade and the Training Process — Code : 781 621

Module 1 Duration : 15 hours

Situational Objective

Statement of the Competency

Determine their suitability for the trade and the training process.

Elements of the Competency

- During this module, the students will:
  - Become familiar with the nature of the trade.
  - Understand the training process.
  - Confirm their career choice.

Learning Context

Information phase

- Learning about the nature and requirements of the job: tasks, work context, standards and regulations, personal qualities and aptitudes required, etc.
- Learning about the job market: sectors of activity and job prospects, working conditions, remuneration, etc.
- Learning about the educational environment: rules, student services, schedule, etc.
- Learning about the training process: program of study, evaluation methods, certification of studies, participation required, etc.

Participation phase

- Visiting the education centre.
- Attending seminars.
- Sharing their views on the trade and their initial reactions to the program of study.
- Meeting with specialists in the trade.
- Visiting businesses.

Evaluation phase

- Producing a report in which they:
  - state their preferences, qualities, aptitudes and expectations with respect to the trade
  - evaluate their career choice by comparing the aspects of the trade with their preferences, qualities, aptitudes and expectations

Instructional Guidelines

- The teacher should:
  - Create a climate that favours the students' personal development and entry into the work force.
  - Encourage all students to engage in discussions and express their opinions.
  - Motivate students to participate in the proposed activities.
  - Help students to arrive at an accurate perception of the trade.
  - Help students understand the relevance of the training program with respect to the trade.
  - Organize visits to businesses representative of the field.
  - Organize meetings with specialists in the field.
  - Provide the students with pertinent reference materials: information on the trade, regulations, program of study, etc.
  - Provide students with the means to assess their career choice honestly and objectively.

Participation Criteria

Information phase

- Gather information on most of the topics to be covered.
- Listen attentively to the explanations given.
- Carefully review the documentation provided.

Participation phase

- Participate in the proposed activities.
- Discuss their opinions with teachers and non-teaching professionals, their classmates and specialists in the trade.

Evaluation phase

- Produce a report in which they:
  - sum up their preferences, qualities, aptitudes and expectations with respect to the trade
  - synthesize the different aspects of the trade
  - explain why they chose to continue or abandon the training program on the basis of the relationship between their preferences, qualities, aptitudes and expectations, and the different aspects of the trade

Health and Safety — Code : 754 992

Module 2 Duration : 30 hours

Situational Objective

Statement of the Competency

Protect health, safety and physical integrity on construction sites.

Elements of the Competency

- At the end of the module, the students will:
  - Have adopted a responsible attitude with respect to health and safety.
  - Be familiar with the importance of complying with occupational health and safety standards and rules.
  - Be able to recognize dangerous situations or behaviours and the applicable preventive measures.

Learning Context

Information phase

- Learning about the risks inherent in construction sites.
- Learning about the rules that apply to health and safety on construction sites.
- Learning what measures to take in the event of an emergency.
- Thinking about the importance of acquiring competencies related to occupational health and safety.

Participation phase

- Experiencing situations in which it is necessary to prevent risks and eliminate dangers to the environment, facilities, equipment, machinery, tools, materials, power sources, etc.
- Participating in activities involving the recognition of risks related to the transportation of loads and work postures in confined spaces.
- Participating in activities involving the recognition of symbols and signals related to risk prevention (hazardous materials and their transportation, road work, etc.).
- Comparing high-risk behaviour observed on construction sites and identifying the basic principles underlying safe behaviour.

Evaluation phase

- Producing a report containing:
  - a summary of their newly acquired knowledge and skills
  - an evaluation of their own attitude to occupational health and safety
  - objectives and means of improving their behaviour

Instructional Guidelines

- The teacher should:
  - Provide the necessary reference materials.
  - Invite occupational health and safety specialists to speak to the students if possible.
  - Make good use of audiovisual materials.
  - Favour learning situations representative of conditions on construction sites.
  - Prevent students from endangering themselves and others during simulations.
  - Encourage all students to participate in discussions.
  - Provide students with evaluation tools (e.g. questionnaires) to help them analyze their experience and determine their objectives.

Participation Criteria

Information phase

- Consult the reference materials provided.
- Describe advantages of complying with health and safety standards and rules.

Participation phase

- Demonstrate a desire to learn by participating seriously in the proposed activities.
- State the principles underlying safe behaviour.
- List the risks inherent in construction sites and the applicable preventive measures.

Evaluation phase

- Present a report including:
  - a summary of their newly acquired knowledge and skills
  - an evaluation of their own attitude to occupational health and safety
  - objectives and means of protecting their health, safety and physical integrity and that of others on a construction site

Using Computers	Code : 781 632

Module 3 Duration: 30 hours

Behavioural objective

Statement of the Competency	**Achievement Context**
Manage computerized data.	• Using a computer and peripherals connected to a network and with access to the Internet, and current application software • Following instructions • Basic computer use, including data management using local and network stations and Internet access

Elements of the Competency	**Performance Criteria**
1 Search for information.	• Proper technique for opening directories • Proper technique for opening files • Proper technique for opening E-mail messages • Effective access to Web sites • Ease of movement within Web sites • Accurate references • Collection of relevant information
2 Transmit information.	• Successful transmission of an E-mail message: – to an individual – to a group • Successful transmission of a file by E-mail • Proper technique for printing data
3 Compile data.	• Proper technique for creating files • Proper technique for deleting, copying and moving blocks of text • Successful saving of a file • Proper technique for closing files
4 File data.	• Proper technique for creating directories • Effective creation of subdirectories • Effective management of electronic messages • Effective management of address book • Proper use of defragmentation command
5 Protect data.	• Proper use of antivirus software • Proper technique for creating backups

For the overall competency

- Effective use of computer
- Appropriate use of reference materials
- Effective use of network
- Organized work

Checking Electrical Circuits — Code : 781 648

Module 4 Duration: 120 hours

Behavioural objective

Statement of the Competency	Achievement Context
Check an electrical circuit.	• Working on a test bench with an electrical circuit containing resistors, capacitors and inductors • Following instructions • Given a circuit diagram • Using: – tools – measuring instruments – personal safety gear

Elements of the Competency	Performance Criteria
1 Interpret the circuit diagram.	• Accurate interpretation of terms • Accurate interpretation of symbols and conventions
2 Calculate values at different points in the circuit.	• Clear vector diagrams • Correct application of laws • Proper use of the appropriate formulas • Accurate calculations
3 Measure values at different points in the circuit.	• Systematic observance of safety measures • Appropriate selection of measuring instruments • Accurate connections • Appropriate use of measuring instruments • Accurate measurements
4 Interpret the results.	• Accurate calculation of discrepancies • Accurate identification of causes of discrepancies
	For the overall competency • Observance of health and safety rules • Structured approach • Careful work

Drawing Sketches	Code : 781 652

Module 5 Duration: 30 hours

Behavioural objective

Statement of the Competency	**Achievement Context**
Draw sketches.	• Working freehand • Following instructions • Given: – a dimensioned isometric projection – a dimensioned orthogonal projection • Using the appropriate pencils
Elements of the Competency	**Performance Criteria**
1 Draw an orthogonal projection.	• Appropriate selection of views • Appropriate arrangement of views • Accurate representation
2 Draw an isometric projection.	• Appropriate selection of angle • Accurate projection angles • Accurate representation
3 Dimension a sketch.	• Relevant information • Appropriate functional dimensioning • Proper positioning of dimensions • Accurate dimensions • Proper use of imperial and metric systems of measurement
	For the overall competency • Compliance with standards and conventions • Observance of shapes and proportions • Use of appropriate types of lines • Careful work

Performing Manual Machining Operations — Code : 781 667

Module 6 Duration: 105 hours

Behavioural objective

Statement of the Competency	Achievement Context

Perform manual machining operations.	• Working on plastics and ferrous and non-ferrous metals
	• Following instructions
	• Given:
	  – drawings
	  – tables of cutting speeds
	• Using:
	  – hand tools and manual equipment
	  – measuring instruments
	  – safety equipment
	  – personal safety gear
	• Production of a moderately complex part within tolerances of ± 0.38 mm (± 0.015 in.)

Elements of the Competency	Performance Criteria
1 Interpret instructions and drawings.	• Accurate interpretation of work order • Accurate interpretation of terms • Location of relevant information • Accurate interpretation of symbols and conventions • Location of manufacturing standards
2 Calculate manufacturing parameters.	• Proper use of the appropriate formulas • Consideration of allowances and tolerances • Accurate calculations
3 Prepare the work.	• Determination of logical sequence of operations • Appropriate selection of materials • Appropriate selection of tools and equipment

4 Do the work.	• Proper use of manual machining techniques:
	  – marking out
	  – filing
	  – sharpening
	  – boring
	  – tapping
	  – other
	• Adaptation of techniques to materials used
	• Accurate dimensions
	• Appropriate surface finishes

5 Check the quality of the work.	• Thorough verification of shapes and dimensions • Identification of defects • Accurate identification of cause of defects
6 Tidy up the work area.	• Careful storage of materials, tools and equipment • Clean work area
	For the overall competency
	• Observance of health and safety rules • Compliance with standards and observance of tolerances • Conformity with drawings and instructions • Appropriate use of tools and equipment • Careful, methodical work • Concern for the economical use of materials

Moving Equipment	Code : 781 672

Module 7 Duration: 30 hours

Behavioural objective

Statement of the Competency	**Achievement Context**

Move industrial equipment.	• With a boom or a compressor with at least 5 HP
	• Following instructions
	• Given:
	  – drawings
	  – tables and charts
	• Using:
	  – a crane operator's handbook
	  – tools and equipment (lever, forklift, hoist, crane, chains, cables, slings, etc.)
	  – personal safety gear

Elements of the Competency	**Performance Criteria**
1 Interpret instructions and technical manuals.	• Accurate interpretation of work order • Location of relevant information • Accurate interpretation of information
2 Estimate the centre of gravity and weight of loads.	• Accurate measurement of parameters • Use of appropriate formulas • Accurate calculations
3 Prepare the work.	• Appropriate selection of elements and accessories for suspending loads • Appropriate selection of lifting devices • Thorough inspection of tools and equipment • Planning of movements adapted to the characteristics of the environment

4 Do the work.	• Appropriate selection and execution of types of knots
	• Position of slings and chains in conformity with centre of gravity
	• Constant attention to the safety of individuals
	• Constant attention to the objects being moved
	• Proper use of lifting techniques
	• Proper movement of loads:
	  – on a horizontal plane
	  – on an inclined plane

5 Store materials and equipment.	• Thorough inspection of equipment • Careful storage of equipment • Clean work area

For the overall competency

- Observance of health and safety rules
- Compliance with standards
- Observance of signalling code
- Conformity with drawings
- Methodical work

Cutting and Welding	Code : 781 685

Module 8 Duration: 75 hours

Behavioural objective

Statement of the Competency	**Achievement Context**
Cut and weld metal.	• Working with sheets and plates of ferrous and non-ferrous metal • Given: – assembly drawings – tables and charts • Using: – semi-automatic welding equipment – tools and accessories – personal safety gear • Electric-arc, semi-automatic and TIG welding for corrective maintenance purposes

Elements of the Competency	**Performance Criteria**
1 Interpret instructions and drawings or sketches.	• Accurate interpretation of work order • Accurate interpretation of welding symbols
2 Prepare the work.	• Appropriate selection of materials and tools • Proper setup of cutting and welding equipment
3 Cut plates.	• Proper adjustment of gas pressure • Angles, shapes and dimensions in conformity with drawings • Clean cuts • Satisfactory deburring
4 Weld metal sheets or plates.	• Proper preparation of surfaces to be welded • Correct positioning of pieces to be assembled • Proper adjustment of welding parameters • Proper tacking prior to welding • Welding techniques in conformity with procedures • Satisfactory cleaning of welds
5 Check the quality of the work.	• Thorough verification of shapes and dimensions • Identification of defects • Accurate identification of cause of defects
6 Tidy up the work area.	• Proper dismantling of cutting and welding equipment • Careful storage of tools, materials and equipment • Clean work area

For the overall competency

- Observance of health and safety rules
- Compliance with standards
- Conformity with drawings and instructions
- Appropriate use of tools and accessories
- Careful work

Connecting Conduits — Code : 781 692

Module 9 Duration: 30 hours

Behavioural objective

Statement of the Competency

Connect tubes, pipes and hoses.

Achievement Context

- Given:
  - copper tubes (1/4 in.) and copper and steel pipes (1/2 in.)
  - accessories
  - sealants
  - drawings and specifications
  - tables and charts
- Following instructions
- Using:
  - hand and mechanical tools
  - measuring instruments
  - a 5.5-bar (80-psi) compressed air supply
  - a water tank
  - personal safety gear
- Maintenance or installation of a piece of equipment involving the connection of an existing conduit

Elements of the Competency	Performance Criteria
1 Interpret instructions, drawings, specifications and technical manuals.	• Accurate interpretation of work order • Accurate interpretation of terms • Location of relevant information • Accurate interpretation of symbols
2 Prepare the work.	• Appropriate selection of fittings, conduits, fasteners and sealants • Appropriate selection of tools and equipment
3 Prepare the tubes, pipes and hoses for assembly.	• Proper use of preparation techniques: – measuring – cutting – bending – flaring – soldering – threading – gluing – fastening – crimping – other • Accurate dimensions

4 Assemble a circuit.	• Proper application of assembly techniques • Leaktight, solid connections • Satisfactory squaring
5 Check the quality of the work.	• Proper performance of leak tests • Thorough verification of dimensions, positioning and solidity of components
	For the overall competency
	• Observance of health and safety rules • Compliance with standards • Conformity with drawings and instructions • Appropriate use of tools and equipment • Careful, methodical work • Concern for the economical use of materials

Industrial Electronics Circuits	Code : 781 707

Module 10 Duration: 105 hours

Behavioural objective

Statement of the Competency	**Achievement Context**
Operate an industrial electronics circuit.	• Working on an industrial electronics circuit including a feeder circuit, an oscillatory or signal processing circuit and a power circuit • Given: – a simulated breakdown – the circuit diagram • Following instructions • Using: – tools – measuring instruments – replacement components – personal safety gear • Overall approach to electronic circuits focusing on the verification of input and output signals

Elements of the Competency	**Performance Criteria**
1 Interpret the circuit diagram.	• Accurate location of components • Accurate explanation of operation of: – feeder circuit – oscillatory circuit – signal processing circuit – power circuit • Recognition of integrated analog circuits • Accurate explanation of role of integrated analog circuits • Accurate identification of signals
2 Measure the values at the different points of: – the feeder circuit – the oscillatory circuit – the signal processing circuit – the power circuit	• Systematic observance of safety measures • Appropriate selection of measuring instruments • Accurate connections • Appropriate use of measuring instruments • Accurate measurements
3 Interpret the results.	• Accurate interpretation of wave forms • Accurate interpretation of measurements • Recognition of differences • Accurate identification of causes of discrepancies

4 Make corrections.	• Recognition of defective components • Appropriate selection of replacement components • Clean seams • Accurate verification of operation of circuit *For the overall competency* • Observance of health and safety rules • Structured approach • Careful work

Using Machine Tools	Code : 781 716

Module 11 Duration: 90 hours

Behavioural objective

Statement of the Competency	**Achievement Context**
Use machine tools.	• Working on plastics and ferrous and non-ferrous metals • Following instructions • Given: – drawings – cutting speed and feed tables • Using: – reference manuals – cutting tools, other tools and equipment – measuring instruments – safety equipment and personal safety gear • Production of a moderately complex part within tolerances of ±0.1 mm (±0.004 in.)

Elements of the Competency	**Performance Criteria**
1 Interpret instructions and drawings.	• Accurate interpretation of work order • Accurate interpretation of terms • Location of relevant information • Accurate interpretation of symbols and conventions • Location of manufacturing standards
2 Calculate the machining parameters.	• Use of appropriate formulas • Consideration of allowances and tolerances • Accurate calculations
3 Prepare the work.	• Determination of logical sequence of operations • Appropriate selection of materials • Appropriate selection of fastening method • Appropriate selection of cutting tools • Appropriate selection of tools, devices and accessories • Proper adjustment of machining speeds

4 Do the work.	• Proper use of machining techniques: – sawing – drilling – turning – milling – grinding – other • Proper adaptation of techniques to materials used • Accurate dimensions • Appropriate surface finishes
5 Check the quality of the work.	• Thorough verification of shapes and dimensions • Identification of defects • Accurate identification of cause of defects
6 Tidy up the work area.	• Careful storage of materials, tools and equipment • Clean work area
	For the overall competency • Observance of health and safety rules • Compliance with standards and observance of tolerances • Conformity with drawings and instructions • Appropriate use of tools and equipment • Appropriate use of measuring instruments • Methodical work • Constant precision and attention to detail • Concern for the economical use of materials

Analyzing Logic Circuits — Code : 781 726

Module 12 Duration: 90 hours

Behavioural objective

Statement of the Competency

Analyze a logic circuit.

Achievement Context

- Working on a device with programmable logic functions
- Following instructions
- Given a graphic representation of the sequence of operations for a piece of equipment
- Using:
  - a simulator with input/output components
  - driver software

Elements of the Competency	Performance Criteria
1 Interpret the circuit's combinational logic diagram.	• Accurate interpretation of data sheets • Accurate identification of number systems • Accurate identification of logic gates
2 Interpret the circuit's sequential logic diagram.	• Accurate interpretation of data sheets • Accurate identification of sequential functions
3 Simplify the circuit's combinational logic equation.	• Accurate identification of input/output variables • Proper structure of truth table • Optimum grouping of variables • Diagram in conformity with combinational logic equation
4 Develop the sequential logic equations for the circuit.	• Accurate identification of input/output variables • Accurate interpretation of timing charts • Graphic representation in conformity with sequential function chart (grafcet) • Logic equations in conformity with sequential function chart (grafcet) • Diagram in conformity with sequential logic equations
5 Compare the actual results with the theoretical results.	• Accurate interpretation of visual data • Proper validation of operation of combinational logic circuit • Proper validation of sequence of operations • Accurate identification of causes of malfunctions

For the overall competency

- Observance of health and safety rules
- Structured approach
- Careful work

Conventional Alignment — Code : 781 732

Module 13 Duration: 30 hours

Behavioural objective

Statement of the Competency

Align shafts.

Achievement Context

- Working on a functional piece of equipment
- Given:
  - drawings and specifications
  - instruction manuals
- Using:
  - an assembly bench
  - tools, spacer rings and other accessories
  - dial gauges
  - measuring instruments
  - mathematical alignment formulas
  - personal safety gear
- Conventional alignment to within 0.127 mm (0.005 in.) using dial gauges

Elements of the Competency	Performance Criteria
1 Interpret instructions, drawings, specifications and technical manuals.	• Accurate interpretation of work order • Location of relevant information • Accurate interpretation of information
2 Prepare the work.	• Appropriate selection of tools and accessories • Thorough inspection of components • Accurate detection of faulty foot adjustment • Proper correction of faulty foot adjustment
3 Take measurements.	• Proper positioning of dial gauges • Accurate adjustment of gauges • Accurate reading of gauges
4 Calculate alignment parameters.	• Appropriate calculations • Accurate calculations
5 Align a shaft: – vertically – horizontally	• Appropriate handling of components • Proper installation of spacer rings • Proper use of alignment techniques
6 Check the work.	• Thorough measurement

For the overall competency

- Observance of health and safety rules
- Compliance with standards and observance of tolerances
- Appropriate use of tools and equipment
- Appropriate use of measuring instruments
- Attention to detail

Maintaining Mechanical Devices — Code : 781 747

Module 14 Duration: 105 hours

Behavioural objective

Statement of the Competency	Achievement Context
Maintain mechanical devices.	• Working on a transmission with a shaft with a minimum diameter of 25 mm (1 in.), a gearbox, ball bearings and transmission components • Given: – a simulated mechanical breakdown – tables and charts • Following instructions • Using: – reference manuals – tools, accessories, products and equipment – measuring instruments – replacement components – personal safety gear – locking devices

Elements of the Competency	Performance Criteria
1 Interpret instructions, drawings, specifications and technical manuals.	• Accurate interpretation of work order • Accurate interpretation of symbols and notes • Accurate identification of components: – bearings – bushings – transmission components – motion transformation components – gearboxes – variable-speed drives • Location of components • Identification of adjustments and tolerances • Accurate identification of types of lubricants • Accurate explanation of operation of system
2 Calculate the transmission and motion transformation parameters for the components to be replaced.	• Use of appropriate formulas • Accurate calculations • Appropriate selection of replacement components
3 Plan the maintenance work.	• Appropriate selection of tools and equipment • Determination of logical sequence of operations
4 Do preventive maintenance work on mechanical devices.	• Accurate assessment of condition of components • Appropriate cleaning, alignment and adjustment • Proper lubrication of components • Proper replacement of worn components

5 Do corrective maintenance work on mechanical devices.	• Accurate identification of cause of problem • Logical disassembly sequence • Accurate sketch of position of components • Accurate assessment of condition of components • Proper repair or replacement of component • Logical reassembly sequence • Proper lubrication of components
6 Check the operation of mechanical devices.	• Thorough verification of positioning of components • Thorough verification of adjustments • Thorough inspection of safety devices
7 Record the information.	• Relevant information • Clear, neat work order
8 Tidy up the work area.	• Careful storage of tools and equipment • Clean work area
	For the overall competency • Observance of health and safety rules • Compliance with standards and observance of tolerances • Observance of manufacturer's recommendations • Appropriate use of tools and equipment • Appropriate use of measuring instruments • Careful work • Constant concern for neatness • Functional mechanical devices

Assembling Pneumatic Circuits — Code : 781 755

Module 15 Duration: 75 hours

Behavioural objective

Statement of the Competency	Achievement Context
Assemble a pneumatic circuit.	• Working on an assembly panel • Following instructions • Given a sequence of operations • Using: – tools and equipment – pneumatic components – a 7-bar (100-psi) compressed air supply – personal safety gear • Design and production of a functional circuit

Elements of the Competency	Performance Criteria
1 Interpret instructions and a pneumatic circuit diagram.	• Accurate interpretation of work order • Accurate interpretation of terms • Accurate interpretation of symbols and conventions • Accurate interpretation of sequence of operations
2 Draw a pneumatic circuit diagram.	• Accurate terminology • Appropriate use of symbols and conventions
3 Calculate the parameters of a pneumatic circuit.	• Proper application of the basic laws • Proper use of the appropriate formulas • Accurate calculations
4 Simulate the operation of a pneumatic circuit using software.	• Proper use of software • Appropriate use of symbols and conventions • Accurate adjustment of circuit characteristics • Proper simulation of sequence of operations
5 Assemble the components of a pneumatic circuit.	• Proper use of techniques for assembling: – components – fittings – conduits • Appropriate arrangement of components
6 Check the operation of the circuit.	• Thorough verification of leaktightness of assembly • Accurate adjustment of circuit parameters • Proper validation of sequence of operations

For the overall competency

- Observance of health and safety rules
- Compliance with standards
- Appropriate use of tools and equipment
- Methodical work and attention to detail

Assembling Hydraulic Circuits — Code : 781 764

Module 16 Duration: 60 hours

Behavioural objective

Statement of the Competency	Achievement Context
Assemble a hydraulic circuit.	• Working on an assembly panel • Following instructions • Given a sequence of operations • Using: – tools and equipment – hydraulic components – a hydraulic unit with 70-bar (1000-psi) minimum pressure – personal safety gear • Design and production of a functional circuit

Elements of the Competency	Performance Criteria
1 Interpret instructions and a hydraulic circuit diagram.	• Accurate interpretation of work order • Accurate interpretation of terms • Accurate interpretation of symbols and conventions • Accurate interpretation of sequence of operations
2 Draw a hydraulic circuit diagram.	• Accurate terminology • Appropriate use of symbols and conventions
3 Calculate the parameters of a hydraulic circuit.	• Proper application of the basic laws • Proper use of the appropriate formulas • Accurate calculations
4 Simulate the operation of a hydraulic circuit using software.	• Proper use of software • Appropriate use of symbols and conventions • Accurate adjustment of circuit characteristics • Proper simulation of sequence of operations
5 Assemble the components of a hydraulic circuit.	• Proper use of techniques for assembling: – components – fittings – conduits • Appropriate arrangement of components
6 Check the operation of the circuit.	• Thorough verification of leaktightness of assembly • Accurate adjustment of circuit parameters • Proper validation of sequence of operations

For the overall competency

- Observance of health and safety rules
- Compliance with standards
- Appropriate use of tools and equipment
- Methodical work and attention to detail

Maintaining Motor Circuits — Code : 781 777

Module 17 Duration: 105 hours

Behavioural objective

Statement of the Competency	Achievement Context
Maintain an AC or DC motor circuit.	• Given: – a simulated three-phase AC or DC motor circuit malfunction – data sheets – a circuit diagram • Following instructions • Using: – tools and equipment – measuring instruments – replacement components – personal safety gear – locking devices

Elements of the Competency	Performance Criteria
1 Interpret instructions, drawings and technical manuals.	• Accurate interpretation of work order • Location of relevant information • Accurate interpretation of symbols • Recognition of control and power circuits • Recognition of type of motor • Accurate differentiation among start-up procedures • Accurate differentiation among braking procedures • Accurate explanation of operation of circuit
2 Plan the work.	• Appropriate selection of tools and equipment • Determination of logical sequence of operations
3 Do preventive maintenance work on a motor circuit.	• Accurate measurements • Thorough verification of solidity of connections • Thorough inspection of components for wear • Accurate evaluation of difference between the actual condition of the equipment and its reference condition • Accurate adjustment of overload relays • Thorough inspection of safety devices
4 Do corrective maintenance work on a motor circuit.	• Accurate identification of cause of problem • Appropriate selection of replacement components • Proper disassembly and reassembly of circuit

5 Verify the operation of the equipment.	• Appropriate, safe start-up • Appropriate measurements taken • Thorough inspection of safety devices
6 Record the information.	• Relevant information • Clear, neat work order
7 Tidy up the work area.	• Careful storage of tools and equipment • Clean work area
	For the overall competency • Observance of health and safety rules • Conformity with the Canadian Electrical Code • Appropriate use of measuring instruments • Careful work • Functional, safe equipment

Maintaining Pneumatic and Hydraulic Equipment	Code : 781 784

Module 18 Duration: 60 hours

Behavioural objective

Statement of the Competency	**Achievement Context**
Maintain pneumatic and hydraulic equipment.	• Given: – a simulated compressor or hydraulic pump malfunction – technical manuals and data sheets – drawings and diagrams • Following instructions • Using: – tools and equipment – measuring instruments – replacement components – personal safety gear – locking devices • Equipment maintenance, including basic compressor, hydraulic pump and motor adjustments and repairs

Elements of the Competency	**Performance Criteria**
1 Interpret instructions, drawings and data sheets.	• Accurate interpretation of work order • Accurate interpretation of symbols and notes • Recognition of types of components: – compressors – pumps – pneumatic and hydraulic motors – distributors – other • Location of elements
2 Calculate the operating parameters of equipment components.	• Use of appropriate formulas • Accurate calculations
3 Plan the work.	• Appropriate selection of tools and equipment • Appropriate selection of replacement components • Determination of logical sequence of operations
4 Do preventive maintenance work on a piece of pneumatic or hydraulic equipment.	• Accurate assessment of condition of components • Appropriate cleaning, alignment and adjustment • Appropriate lubrication of elements and components • Accurate assessment of condition of oils • Proper replacement of worn elements

5 Do corrective maintenance work on a piece of pneumatic or hydraulic equipment.	• Accurate identification of cause of problem • Logical disassembly sequence • Accurate sketch of position of elements • Accurate assessment of condition of components • Proper repair or replacement of elements • Logical reassembly sequence • Accurate positioning of elements • Proper lubrication of components
6 Check the operation of the equipment.	• Thorough verification of the operating parameters of the components • Thorough verification of adjustments • Thorough inspection of safety devices
7 Record the information.	• Relevant information • Clear, neat work order
8 Tidy up the work area.	• Careful storage of tools and equipment • Clean work area
	For the overall competency • Observance of health and safety rules • Compliance with standards • Conformity with manufacturer's recommendations • Appropriate use of tools and equipment • Appropriate use of measuring instruments • Careful work • Constant concern for neatness • Functional, safe equipment

Calibrating a Control Loop — Code : 781 794

Module 19 Duration: 60 hours

Behavioural objective

Statement of the Competency	Achievement Context
Calibrate a control loop.	• Working on a simulator with temperature, flow or level controllers • Following instructions • Given data sheets • Using: – codes and standards – tools – measuring instruments – programming software – personal safety gear • Basic operations on industrial processes, such as calibrating instruments, adjusting sensors and modifying the parameters of a regulator

Elements of the Competency	Performance Criteria
1 Interpret instructions, drawings and data sheets.	• Accurate interpretation of work order • Accurate interpretation of symbols • Accurate interpretation of flow diagram • Accurate differentiation between open-loop and closed-loop diagrams • Accurate identification of sensors and transmitters • Accurate identification of regulators
2 Plan the work.	• Appropriate selection of tools • Appropriate selection of measuring instruments • Determination of logical sequence of operations
3 Connect a control loop.	• Accurate location of connections • Proper connection of transmitters • Proper connection of regulator • Cabling in conformity with connection diagram
4 Modify the parameters of a control loop.	• Observance of adjustment procedure • Accurate adjustment of transmitters • Accurate configuration of regulator
5 Check the operation of a control loop.	• Appropriate measurements taken • Accurate interpretation of data • Thorough inspection of alarms

6 Record the information.	• Relevant information • Clear, neat work order
	For the overall competency
	• Observance of health and safety rules • Conformity with current codes and standards • Appropriate use of computer equipment • Functional, safe equipment

Maintaining Electropneumatic and Electrohydraulic Circuits — Code : 781 804

Module 20 Duration: 60 hours

Behavioural objective

Statement of the Competency	Achievement Context
Maintain electropneumatic and electrohydraulic circuits.	• Given: – a simulated electropneumatic or electrohydraulic circuit malfunction – data sheets – electrical and pneumatic or hydraulic circuit diagrams • Following instructions • Using: – tools and equipment – measuring instruments – replacement components – personal safety gear – locking devices

Elements of the Competency	Performance Criteria
1 Interpret instructions, drawings and technical manuals.	• Accurate interpretation of work order • Location of relevant information • Accurate interpretation of symbols • Recognition of type of valve • Recognition of type of sensor • Recognition of operating procedure of: – the electropneumatic circuit – the electrohydraulic circuit • Accurate explanation of operation of circuit
2 Plan the work.	• Appropriate selection of tools and equipment • Determination of logical sequence of operations
3 Do preventive maintenance work on an electropneumatic or electrohydraulic circuit.	• Accurate measurements • Accurate adjustment of pressure • Accurate adjustment of sensors • Thorough verification of solidity of connections • Thorough inspection of safety devices • Accurate evaluation of difference between the actual condition of the equipment and its reference condition
4 Do corrective maintenance work on an electropneumatic or electrohydraulic circuit.	• Accurate identification of cause of problem • Appropriate selection of replacement component • Proper disassembly and reassembly of circuit

5 Check the operation of the equipment.	• Accurate adjustment of the operating parameters • Appropriate, safe start-up • Appropriate measurements taken • Thorough inspection of safety devices
6 Record the information.	• Relevant information • Clear, neat work order
7 Tidy up the work area.	• Careful storage of tools and equipment • Clean work area
	For the overall competency • Observance of health and safety rules • Conformity with the Canadian Electrical Code • Appropriate use of measuring instruments • Careful work • Functional, safe equipment

Programming Controllers — Code : 781 816

Module 21 Duration: 90 hours

Behavioural objective

Statement of the Competency	Achievement Context

Program a controller.	• Working on a functional automated system or a simulator
	• With a programmable controller with analog inputs/outputs and an on/off control
	• Following instructions
	• Given data sheets
	• Using:
	  – programming software
	  – personal safety gear
	• Programming of controllers using different industrial communications protocols (Ethernet, inter-controller communication and access to remote terminal units via Device Net, etc.) and user interfaces

Elements of the Competency	Performance Criteria
1 Interpret drawings and data sheets.	• Location of relevant information • Accurate location of connection points • Accurate location of communication ports • Recognition of memory structure
2 Use programming software.	• Accurate differentiation among programming languages • Satisfactory configuration of special cards • Recognition of communications protocols • Effective use of software
3 Use user interface software.	• Satisfactory configuration of interface • Satisfactory communication between interface and controller • Effective use of software
4 Structure a controller program.	• Accurate identification of input/output elements • Determination of combinational and sequential operations of an automated process • Accurate definition of run and off modes
5 Implement the program.	• Effective use of instruction set • Successful downloading of program into controller • Proper operation of automated process • Successful saving of data

For the overall competency

- Observance of health and safety rules
- Observance of methods and conventions related to the programming of controllers
- Appropriate use of computer equipment

Electronic Motor Control Devices — Code : 781 824

Module 22 Duration: 60 hours

Behavioural objective

Statement of the Competency	Achievement Context
Activate an electronic motor control device.	• Working on a piece of functional equipment or on a simulator with speed or position controls • Following instructions • Given data sheets • Using: – tools – measuring instruments – programming software – personal safety gear • The main electronic devices considered are AC and DC variable-speed drives, step motor controllers and servo-actuators

Elements of the Competency	Performance Criteria
1 Interpret instructions, drawings and data sheets.	• Accurate interpretation of work order • Location of relevant information • Recognition of type of control device • Accurate interpretation of the operating parameters of the device • Accurate location of feedback components • Accurate location of communication ports
2 Plan the work.	• Appropriate selection of tools • Appropriate selection of measuring instruments • Determination of logical sequence of operations
3 Connect an electronic control device to a motor circuit.	• Accurate location of connections • Accurate circuit diagram • Cabling in conformity with connection diagram • Appropriate operation of centralized and remote control modes
4 Modify the operating parameters of the device.	• Proper use of programming pad • Effective use of programming software
5 Check the operation of the device.	• Appropriate measurements taken • Thorough verification of sequence of operations • Thorough inspection of safety devices
6 Record the information.	• Relevant information • Clear, neat work order

For the overall competency

- Observance of health and safety rules
- Conformity with the Canadian Electrical Code
- Observance of methods and conventions related to the programming of an electronic motor control device
- Appropriate use of computer equipment
- Functional, safe equipment

Job Search Techniques — Code : 781 831

Module 23 Duration : 15 hours

Situational Objective

Statement of the Competency

Use job search techniques.

Elements of the Competency

- During this module, the students will:
  - List potential employers.
  - Write a résumé and a cover letter.
  - Participate in a screening interview.

Learning Context

Information phase

- Learning about the companies that correspond to their personal and occupational interests.
- Consulting different sources of information.
- Planning the job search.

Participation phase

- Writing a résumé and a cover letter.
- Following up.
- Participating in a screening interview.

Evaluation phase

- Identifying their strengths and weaknesses with respect to the job search.

Instructional Guidelines

- The teacher should:
  - Provide a wide variety of pertinent reference materials.
  - Provide students with sample résumés and cover letters.
  - Make sure that students understand the importance of being well equipped for a job search and that they plan their search.
  - Set up simulated screening interviews.

Participation Criteria

Information phase

- Gather information about the companies in the field.
- Consult different sources of information.
- Plan the job search.

Participation phase

- Write a résumé and a cover letter.
- Follow up.
- Participate in a screening interview.

Evaluation phase

- Present their strengths and weaknesses with respect to the job search.

Installing an Automated System — Code : 781 847

Module 24 Duration: 105 hours

Behavioural objective

Statement of the Competency	Achievement Context
Install an automated system.	• Working in a team • With assembly components • Following instructions • Given: – data sheets and mechanical assembly drawings – the system's electrical and pneumatic or hydraulic circuit diagram • Using: – tools, accessories and equipment – measuring instruments – personal safety gear – locking devices • Newly designed or modified industrial equipment controlled by a programmable controller (PLC)

Elements of the Competency	Performance Criteria
1 Interpret instructions, drawings and installation specifications.	• Accurate interpretation of work order • Location of relevant information • Accurate interpretation of symbols and notes • Accurate identification of components and elements to be installed • Identification of adjustments and tolerances
2 Plan the work.	• Appropriate selection of tools and measuring instruments • Determination of logical sequence of operations • Thorough inspection of components
3 Do the work.	• Careful handling of components • Solid anchoring of equipment • Accurate machining of components • Proper assembly of components • Appropriate installation of ducts • Proper pulling of conductors • Satisfactory installation of electrical equipment

4 Check the operation of the system.	• Thorough inspection of input/output elements • Sequential, safe start-up of equipment • Thorough verification of operation of safety devices • Accurate adjustment of sensors • Thorough verification of the controller program's run mode • Accurate verification of sequence of operations • Appropriate, effective adjustments
5 Record the information.	• Relevant information • Clear, neat work order
6 Tidy up the work area.	• Careful storage of tools and equipment • Clean work area
	For the overall competency
	• Observance of health and safety rules • Conformity with the Canadian Electrical Code • Conformity with instructions • Close communication with the different resource persons • Appropriate use of tools and equipment • Appropriate use of measuring instruments • Careful, methodical work • Functional, safe equipment

Planned Maintenance	Code : 781 853

Module 25 Duration: 45 hours

Behavioural objective

Statement of the Competency	**Achievement Context**
Implement a planned maintenance program.	• For functional industrial equipment • Given: – a work order produced by a maintenance software program – data sheets – drawings and diagrams of the equipment – the manufacturer's maintenance manual • Using: – tools and equipment – measuring instruments – maintenance software – replacement components – personal safety gear – locking devices

Elements of the Competency	**Performance Criteria**
1 Interpret instructions, drawings and technical manuals.	• Accurate interpretation of work order • Location of relevant information
2 Do a visual inspection of the equipment.	• Thorough verification of the condition of the components and elements of the equipment • Methodical verification • Clear, accurate recording of information
3 Do a statistical inspection of the equipment.	• Recognition of check points • Thorough data collection • Accurate compilation of data
4 Interpret the results.	• Accurate interpretation of visual observations • Accurate reading of tables and graphs to predict equipment wear • Accurate interpretation of data collected from these tables and graphs • Detection of equipment weaknesses and failures
5 Propose preventive or corrective maintenance for the equipment.	• Appropriate suggestions • Clear presentation of suggestions and justification

6 Do the planned maintenance.	• Proper performance of preventive maintenance operations • Proper performance of corrective maintenance operations
7 Record the information.	• Relevant information • Clear, neat work order
8 Tidy up the work area.	• Careful storage of tools and measuring instruments • Clean work area
	For the overall competency • Observance of health and safety rules • Appropriate use of measuring instruments • Effective use of maintenance software • Close communication with the different resource persons • Functional, safe equipment

Troubleshooting Automated Systems — Code : 781 866

Module 26 Duration: 90 hours

Behavioural objective

Statement of the Competency	Achievement Context
Troubleshoot an automated system.	• Given: – a simulated breakdown – data sheets – electrical and mechanical drawings of the system • Following instructions • Using: – tools, accessories and equipment – measuring instruments – sequential function charts or ladder diagrams – replacement components – personal safety gear – locking devices

Elements of the Competency	Performance Criteria
1 Interpret instructions, drawings and data sheets.	• Accurate interpretation of request • Location of relevant information • Accurate explanation of operating mode of system • Accurate interpretation of sequence of operations • Accurate identification of run modes • Accurate explanation of communications network
2 Analyze the control part of the system.	• Accurate decomposition of the controller's program • Accurate interpretation of controller data • Satisfactory inspection of run and off modes • Accurate interpretation of combinational and sequential processing
3 Monitor the system.	• Appropriate use of software • Accurate differentiation between diagram and process • Accurate interpretation of trend lines • Accurate verification of defects and alarms • Appropriate modification of operating parameters
4 Determine the cause of a problem.	• Accurate location of problem • Consideration of all possible causes • Appropriate measurements taken • Accurate diagnosis

5 Make a correction.	• Appropriate selection of replacement components • Proper disassembly and reassembly of components • Accurate adjustment of mechanical components • Satisfactory connection of conductors • Accurate adjustment of sensors
6 Check the operation of the equipment.	• Appropriate measurements taken • Accurate adjustment of operating parameters • Appropriate, safe start-up of system • Conclusive operating mode of system • Thorough verification of operation of safety devices
7 Record the information.	• Relevant information • Clear, neat work order
8 Tidy up the work area.	• Careful storage of components, tools and equipment • Clean work area
	For the overall competency • Observance of health and safety rules • Close communication with the different resource persons • Appropriate use of tools and equipment • Appropriate use of measuring instruments • Self-control in critical situations • Structured approach • Careful work

Entering the Work Force — Code : 781 876

Module 27 Duration : 90 hours

Situational Objective

Statement of the Competency

Enter the work force.

Elements of the Competency

- During this module the students will:
  - Learn about their position in a company.
  - Perform tasks in the workplace.
  - Apply current regulations.
  - Learn about changes in perception brought about by a practicum in the workplace.

Learning Context

Information phase

- Looking for a practicum position.
- Learning about the terms and conditions of the practicum and other relevant information.
- Learning about the organization of the company.
- Learning about their job and their position in the company.

Participation phase

- Observing the work context.
- Performing different trade-related tasks or assisting in their performance.
- Determining whether the practicum coordinator is satisfied with the tasks performed.
- Noting their observations about the work context and the tasks performed in the company.

Evaluation phase

- Producing a report in which they:
  - describe the requirements of the workplace
  - describe their participation in trade-related tasks
  - assess how their experience influences their choice of job
- Participating in a group meeting to discuss their view of the experience.

Instructional Guidelines

- The teacher should:
  - Provide students with a list of potential practicums.
  - Ensure close cooperation between the school and the company.
  - Develop observation checklists or questionnaires and a sample logbook for the students.
  - Make sure that students are supervised by a responsible employee of the company (tutor).
  - Ensure the regular support and supervision of students.
  - Intervene in the event of difficulties or problems.
  - Encourage students to voice their opinions and express themselves, especially when comparing their initial perceptions of the trade with their experience in the workplace.

Participation Criteria

Information phase

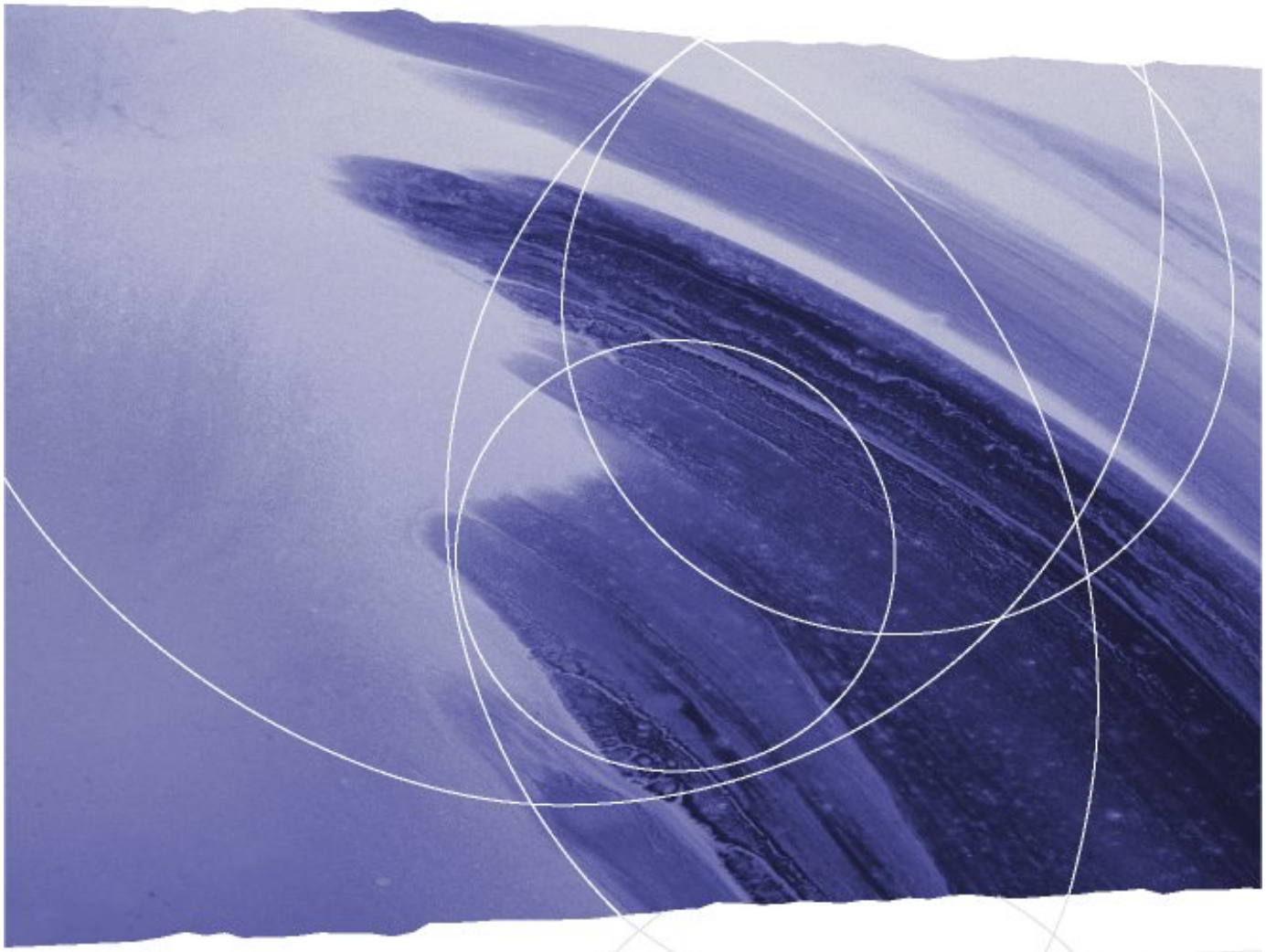
- Meet with a representative of the company with a view to obtaining a practicum position.
- Gather information about the practicum and the organization of the company.
- Describe the tasks to be performed during the practicum.

Participation phase

- Follow company instructions with respect to activities, work schedules and professional ethics.
- Apply the occupational health and safety rules in effect in the workplace.
- Perform assigned tasks.
- Make daily notes of their observations about the tasks performed in their logbook.

Evaluation phase

- State their observations about at least five aspects of the work context and about the tasks performed during the practicum.
- Discuss their self-evaluation report.
- Summarize their experience in the workplace, indicating how it will influence their choice of job.
- Share their experience in the workplace with their classmates.



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